



FRIDAY, APRIL 8.

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Contributions.

Surface Cattle Guards vs. Pit Guards.

TO THE EDITOR OF THE RAILROAD GAZETTE:

That good riding track and economical maintenance of way depend on a multiplicity of apparently unimportant details is nowhere more fully attested than in the marked betterment resulting from the substitution of the surface guard for the old style pit guards which served for years to protect the right of way from cattle.

On lines of railroads running through the middle and western groups of the agricultural states, village streets and highway crossings needing protection against stock range from 20 to 320 rods apart, and with the old style pit guard there was introduced a variety of road conditions at each street or highway crossing. Taking, for instance, a highway 40 ft. wide, you would pass from the roadbed to the pit guard, which, in construction, conformed very nearly to a timber wall culvert, the rail being carried on longitudinal timbers. From this you would pass to 12 ft. of open roadway, then 16 ft. of planked track, another 12 ft. of open roadway to another pit guard, then to roadway beyond. Even in the most favorable weather it was difficult to so adjust these varying conditions as to prevent more or less violent oscillations of a fast moving train, and a disagreeable motion was experienced every 20 seconds to 2 minutes, according to the distance apart of these crossings.

In winter this difficulty was aggravated by the action of the frost, and only the closest watchfulness and care made them even tolerable. It will be noted that with the old pit guards there were six distinct changes of roadbed in less than 60 ft., whereas by the introduction of surface guards the changes are reduced to two, the only variation from the ordinary conditions of roadbed being the necessary crossing plank in the centre of highway, the guards themselves being supported by cross-ties the same as elsewhere.

All this is aside from the question of relative safety. Every railroad man knows what a danger trap a pit guard is.

R.

Some Cases in which Bridge Guards Are Not Effective.

CRDAR RAPIDS, Ia., Feb. 26, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have often seen in the *Railroad Gazette* letters on guards and rerailing devices at the ends of bridges, the simplest and best being the well-known, inside guard rails, coming to a point at the centre of the track, some distance from each end of a bridge. Should a derailed truck come along, and the wheels on each side keep their own sides of this guard rail, it is quite probable the truck will be replaced on the rails. The points which might prevent this are, the truck being too badly damaged to run, or where the side bearings lock. Should a derailed truck get far enough over to take the wrong side of the guard rail, a wreck is inevitable, and, to obviate this, many roads have fitted outside guards.

In a general way derailments are of two classes, first that in which the rear wheels of a truck (referring to the direction of motion) leave the track, and second that in which the front pair leaves the track first. In the first case the derailed wheels will generally follow the ones on the track until they are replaced by the rerailing device. In the second case as soon as the front wheels leave the rails they begin to diverge, and often

reach a pretty wide angle. At this moment there are two forces at work, one nearly in the direction in which the train is running, and the other in the direction of the planes of the truck wheels. On an ice bound track there is a bare possibility that the truck might slip sideways a short distance, be turned by the outside guard, and eventually be replaced on the rails. But under ordinary conditions that truck is going to be crushed, or roll over sideways, lifting its own car and swinging the end of the car ahead of it off the rails, and, should the coupling break, so much the better for the bridge. If the speed is high, and many cars behind, things are favorable for a bad wreck.

Should the coupling hold, the centre of the end of the car could swing about 6 in. from the centre of the track, owing to side play in the drawheads and slack of link (with swing beam trucks perhaps more, with rigid trucks or vertical plane couplers less). Then, assuming the truck to have 33-in. wheels, a wheel base of about 4 ft. 8 in. and be at an angle of 45 degrees to the track, the edge of the tread of the farthest out wheel would about touch the top edge of a guard 10 in. high and 5 ft. from the centre of the track.

Should the coupling break about this time the force which acted in the direction in which the train moved would, to a great extent, act in the direction in which the truck pointed, and if it stood the shock and did not climb over the guard it might chance to turn and be replaced at the bridge end. Passenger-coach trucks (six-wheeled) might be turned easier than freight-car trucks, because, owing to their greater wheel base, they would strike the guard at a sharper angle.

To obtain the best results from an outside guard, it should catch the wheel as soon as it is fairly on the ties. Now the question is whether two or more outside guards placed closer to the rail would not be more effective than one longer one. They might be of any convenient length, say 18 to 20 ft., the farther end being about 2 ft. from the rail, and the end nearer the bridge being about 10 in. from the rail, the nearer end of one being lapped by the outside end of the one adjoining. The edge of a wooden guard which is liable to be in contact with a wheel should be covered with iron.

Experiments to test the value of these appliances do not appear to be of much use, because the conditions which occur or the mechanical points involved when a truck leaves the track under a car in a train running 35 or 40 miles per hour cannot easily be duplicated.

P. W. HYNES,

Wrecking Foreman, B., C. R. & N. R. R.

The Responsibility for the Tunnel Disaster.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Will you not, with your knowledge of the past history of the Fourth Avenue Tunnel, answer one question for a daily traveler through that tunnel?

Is not the state itself responsible for all the tunnel disasters, past and future? In other cities the various roads enter the city to their local depots without being required to burrow underground. New York City has been adjudged by the state to be much above having even one such open air entrance. For the sake of the merely personal comfort (partially imaginary) of the residents along a couple of dozen blocks, the safety of ten million passengers per annum is ignored, and vastly greater discomfort inflicted upon them than is spared the few. The state decrees that we shall be hermetically sealed up in cars in the hottest weather, or that, instead of having a little smoke wafted to us in the open air, as might be the case with the residents along an open track, we shall have it forced into our faces and lungs in a close tunnel. Not even very high tunnels with smoke room are allowed by the state; this would interfere with the view of the gilt-edged residents of those two dozen blocks.

The state jams a low, artificial covering close down over the trains, crowds the steam and smoke down about the engineer and fireman, and then through its juries looks about for some poor fellow upon whom to fasten the blame for its own misdeeds in demanding unnatural conditions upon the people's highway in favor of a few wealthy and influential residents. The poorer multitude who have to go further north, as well as those who go from preference, and the public generally, suffer for the luxury of the few. What is the use of the state's right of "eminent domain" if it cannot take away from the few that tunnel roof for the benefit of the many? A clear opening 48 ft. wide is enough—the street is 90 ft. wide between curb lines. The tunnel could be reduced to a length to be worked in one block only, and no serious damage result to the residents.

The traveling public has been patient because it has supposed the long tunnel a necessity, and the company has been patient in bearing this infliction so long, and in carrying the blame for the state's requirements. The voters interested in opening the tunnel are ten for every one interested in keeping it sealed up. The legislature should bear this in mind. The state, by imposing conditions unnatural and unusual in the cities of this country, and then in asking the company to run its road by a lot of machinery, mechanical devices, fans and electric lights and torpedos, etc., etc., is doing a good deal, merely to favor these few residents and property holders. Who is to blame for poor results?

ONE WHO IS NOT A STOCKHOLDER.

Shall Railroad Men Discuss?

TO THE EDITOR OF THE RAILROAD GAZETTE:

The Latin prefix *dis* carries with it an emphatic prohibitive and negative meaning, it is true, but, although it is a question whether or not some emergencies in an active railroad man's life can only be met, like the case of Stonewall Jackson's army mules in the river on a hot day, by judicious use of a few "cuss words," it is not my intention to undertake a homiletic essay in that direction.

The fact that the spring session of the General Time Convention is to be held next week naturally gives rise to the question: Is it worth while for the managing and operating officers of railroads, together with heads of departments and other officials, to meet periodically and with as large a representation throughout the country as possible, solely for the purpose of comparing views and discussing matters directly pertaining to their own branch of the railroad profession? And upon the very threshold of the subject we are confronted with the counter query: Why does the meeting of the Time Convention "naturally" suggest the question above stated?

Is it not there that anything like free and healthy discussion is—well, not exactly frowned upon or sat upon, but, say, partially congealed, not to say frozen out—by the very excess of weight and dignity, and possibly by the lack of exact knowledge in details on the part of many prominent members of that grave and important body? Is it not there that the inexorable committee system virtually monopolizes discussion, and that, in fact, no subject can be introduced to the notice of the convention that has not passed the sieve of the Executive Committee? Is it not there that, when the elaborate reports of committees, perhaps bristling with statistics and information, gathered with great industry and ability, are presented, discussion falls dead, because members either feel unprepared to criticize off-hand a learned report or do not wish to lose cast or acquire the reputation of being cranky and perhaps foolish opponents of measures bearing the sanction of large and eminently respectable committees whose members naturally are taken from the stronger roads.

Be this as it may, and whether the Time Convention body runs too much to brain and too little to leg, or whether its machinery is too ponderous and slow-moving to be usefully effective, it is, notwithstanding, a strongly established and apparently permanent organization, and if any reforms in the directions hinted at are needed, they must spring from the organization itself, which, like all others, must make its own struggle for a live existence and prove itself fit to survive if it aspires to become a means of large usefulness and helpfulness to the many toilers of lesser rank in the railroad world.

Then there is the American Society of Railroad Superintendents, an organization that has had more or less of a chameleon existence, although of late years it has shown a marked tendency toward greater activity and individuality, as well as toward independent and wholesome discussion on all questions concerning which a railroad superintendent is rightly supposed to have some knowledge, even though but indirectly related to his special duties as an operating officer. The society is said to be now in a very healthy and flourishing condition, although perhaps it has not met with all the encouragement it should have received from the general managers, thus causing many superintendents to be deterred from membership by the feeling that their superior officers scarcely appreciate the value of the society to its members.

Naturally the topics of discussion brought up in the superintendents' society are identical with those which have been presented to the Time Convention. For instance, the movement in favor of a uniform standard code of operating rules originated with the superintendents' organization, which has also, at one time or another, discussed questions pertaining to maintenance of roadway, car service, safety appliances, train heating and signaling. The latter subject is now assigned to a special committee, which is expected to report at the annual meeting in October next. The meetings of the society, now held annually instead of semi-annually, as heretofore, occur a day or two before the fall meeting of the Time Convention; and, partly for that reason as well as from the fact that there has been delicacy on the part of the society in intruding upon ground occupied by questions under consideration by the General Time Convention, also because of a feeling that the representatives of the railroads naturally give preference to their attendance to the more influential body, it has come about that the superintendents' society has been considered by many as a sort of second-rate side-show to the Time Convention. The result of all this has been to render it a difficult if not a thankless task for the gentlemen constituting the active members of the superintendents' society to bring their organization into the occupancy of that portion of the railroad field which it ought to occupy and to which it is fairly entitled.

In regard to the associations of the Master Mechanics, Master Car Builders, and Road Masters, and those of lesser scope, such as the Car Accountants, Train Dispatchers, Yard Masters, etc., it may be sufficient to say that, occupying the position of specialists in the discussion of questions relating to mechanical and other details (which they are themselves the most competent to understand and pass upon), that very freedom of dis-

cussion which is so necessary to enlightenment and progress easily becomes spontaneous and interesting.

But after all some one may say (and there is a certain speciousness in the argument, it is true) that it is a fact that nearly all the great improvements and innovations in railroad development have been conceived, invented, perfected and introduced by men who have not been officially connected with railroads, as evidenced by the great names of Bessemer, Westinghouse, Pullman and others, while a very large number of lesser improvements and inventions are due to the constantly increasing numbers of the engineering profession, not a few of whom, indeed, are among the most eminent operating railroad officers in the country. It may be said to follow, therefore, that very little material advancement can be expected as the result of the discussions of men who are simply bearing the cares and burdens (never more onerous than to-day) pertaining to the different branches of railroad work; for the arduous duties of these men permits very little time to work out and carry into practical success novel and hitherto untried methods and device, which in the end bring about that general improvement and advantage which we are all seeking and which is characteristic of the age.

Notwithstanding all that has been or may be said against railroad men talking too much or wasting too much time in becoming acquainted with, comparing and testing the different schemes, devices and methods of practice which may be advocated, there can be no doubt that well organized bodies of railroad officials, meeting with regularity and discussing freely and systematically questions relating to their professional interests, cannot but be beneficial to the participants, and ought to be encouraged and sustained.

SIC TRANSIT.

The St. Clair Tunnel Locomotives.

The engraving (inset) shows a new design of tank locomotive built for the Grand Trunk Railway of Canada by the Baldwin Locomotive Works. It is known as the "Decapod Tank Freight" type, and has a guaranteed hauling capacity of 700 tons (2,240 lbs.) up a two per cent. grade. Four of these engines are built to operate the St. Clair tunnel, a description of which appeared in the *Railroad Gazette* Sept. 20, 1890. At either end (in the cuttings and in the tunnel) there is about 5,000 ft. of the two per cent. grade.

The general dimensions and description of this engine are as follows:

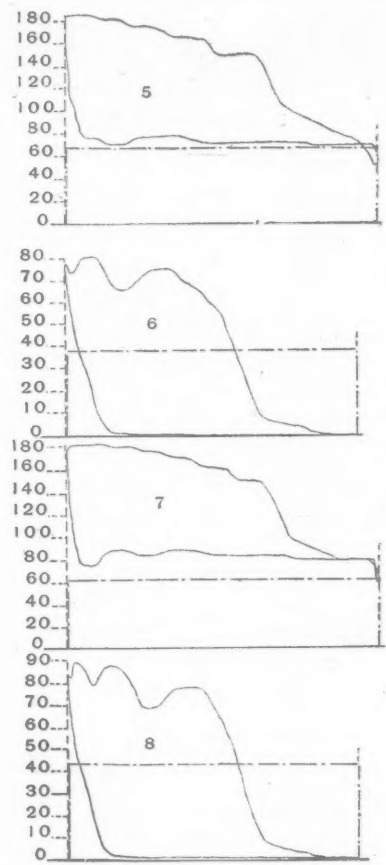
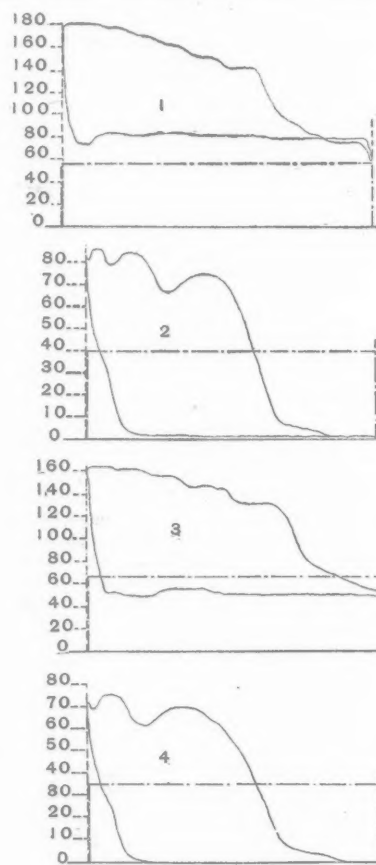
Cylinders..... 22 in. diam. x 28 in. stroke.
Driving wheels..... 50 in. diam.
Driving wheel centres (cast iron)..... 44 in.
Tires (standard Otis steel)..... 3 in. thick.
Tires, first, second, fourth and fifth pairs, flanged, 5½ in. wide; third pair, plain, 6 in. wide.
Tires secured by Mansell retaining rings.
Tires, first and fifth pairs, 1 in. play between rails; second and fourth, ¾ in. play.
Boiler of ¾ in. steel..... 74 in. diam.
Rivets..... 1 in. diam., 2½ and 3½ in. centres.
Laps—all longitudinal seams have double riveted butt joints, with double covering strips.
Steam pressure..... 160 lbs. per sq. in.
Tubes, 281, iron..... 2½ in. diam., 13 ft. 6 in. long.
Firebox..... 12½ in. long x 42½ in. wide.
Water spaces..... 3 in. wide at sides, 1 in. at back.
Firebrick arch supported by top bolts.
Side screw stays, ¾ in. diam.; crown screw stays, 1 in. diam., riveted over at top and bottom.
Grates..... Water tubes with drop bars.
Fuel..... Anthracite coal.
Crossheads of cast steel, with phosphor bronze bearings.
Steam chest valves..... Balanced.
Cylinder lubricators..... Seiber's sight feed.
Injectors..... Two Friedman No. 10 W. F.
Brakes—Westinghouse American, operated by air, on fronts of all wheels, with Roes-Meehan shoes.
Tank capacity, 1,800 galls. (277 cu. in.) of water and 3 tons of coal.
Wheel base total..... 18 ft. 5 in.
Gauge of track..... 4 ft. 8½ in.
Weight on drivers in working order..... 195,000 lbs.
Cooke steam bell ringer.

The weight on drivers is greater than that of any other locomotive which has come to our knowledge. It is believed to be the largest locomotive in the world, and with a coefficient of friction on the rail of 600 lbs. per ton would give a hauling force on the drawbar of 58,500 lbs. The resistance of 700 tons on a two per cent. grade is about 39,400 lbs. Add to this the resistance of the engine itself—about 5,000 lbs.—and the total resistance to overcome is about 44,400 lbs. This is with the liberal allowance of 7 lbs. per ton of load for friction. Hence it is seen that this engine has a considerable margin in which to work with a clean rail. The rails used will weigh 100 lbs. per yard.

Builder.	Road.	Date.	Type.	Cylinders.	Weight on drivers, lbs.
Central Pacific.	C. P.	1881	El Gobernador.	21 x 26	121,000
Baldwin	Brazil	1885	Decapod	22 x 28	128,000
Beyer, Peacock & Co.	Mersey Tunnel	1886	10-wheel tank	21 x 26	115,550
Baldwin	Phila. & Reading	1888	Consolidation	22 x 28	138,000
"	B. & O.	1889	"	20 x 26	112,900
"	North'n Pacific	1889	"	22 x 28	135,000
"	St. Clair Tunnel	1891	10-wheel tank	22 x 28	195,000

This is a particularly handsome engine and represents very forcibly the lines which American builders are following to reach the most economical type of heavy freight engine.

The boiler fronts are of pressed steel, and of an excellent design, easily repaired and kept tight. The guides are short and heavy, with large wearing surfaces at the crosshead, an excellent example of the Laird



Indicator Diagrams showing Cylinder Pressures in Compound Locomotives while Braking.

type. The side rods have solid ends and all of the latest improvements. The boiler is one of the largest, if not the largest, that has ever been constructed for a locomotive; it is 74 in. diameter and is made of ¾-in. steel plates.

The table above gives the weights and other particulars of the largest engines built in the last decade, as shown by the files of the *Railroad Gazette*.

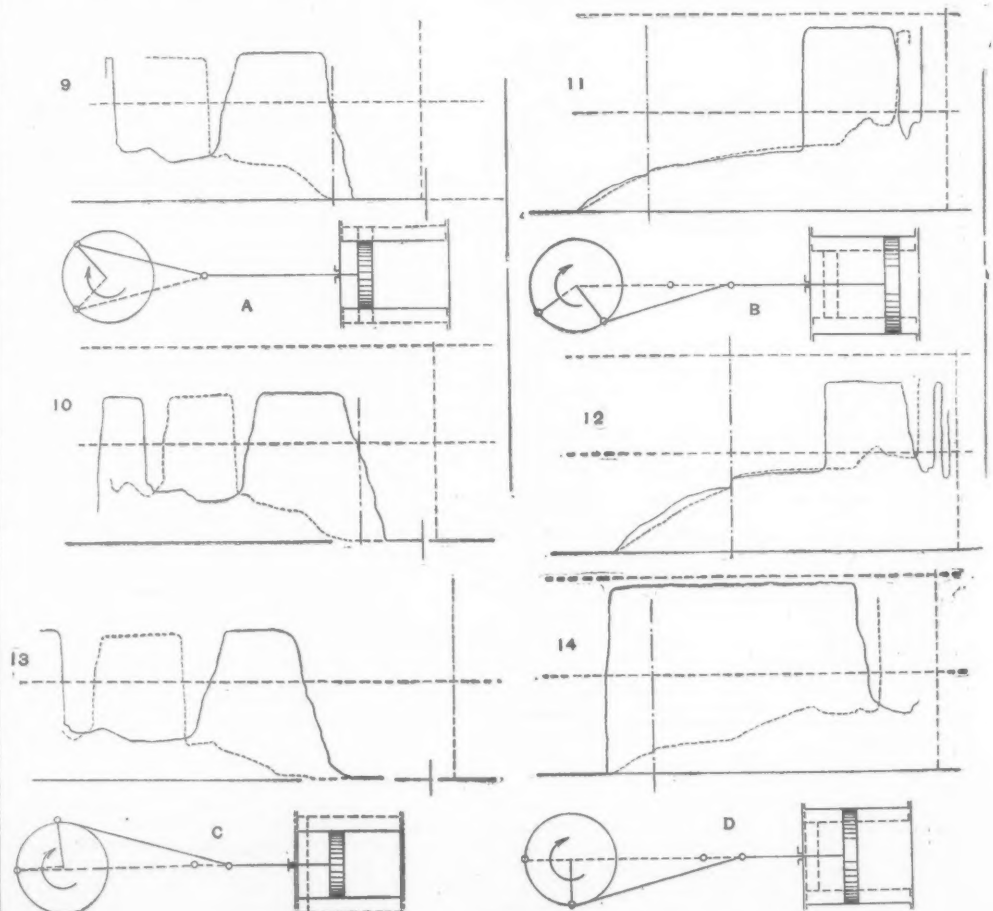
Braking Power of the Steam Cylinders of Compound Locomotives.

Some time since a discussion was raised in Germany as to the action of a compound engine when it was desired to use the cylinders in reversed action to furnish braking power for trains. To determine the precise ac-

tion, experiments were made by Mechanical Director Klein, of the Saxony State railroads, of which the following is a general account:

The indicator cards 1, 2, 3, 4, 5, 6, 7 and 8 show the variation in steam pressure in the high and low-pressure cylinders of the compound engine "Port Said" when the engine was going ahead with reversing lever in the back gear, the throttle valve being wide open. The speed was 18.6 miles per hour. The steam pressure in the boiler averaged about 173 lbs. per sq. in., and in the receiver about 87½ lbs. per sq. in. The ratio of the cylinder volumes is as 1 to 2. The diameter of the driving wheels is 74 in.

The table gives the particulars of the indicator cards. The dotted horizontal lines across the cards represent the average mean effective pressures. The engine was



Diagrams showing Braking Power of Compound Locomotive Cylinders.

fitted with a Lindner starting gear, and the object was to show whether this gear interfered with the working of the engine in back gear when running ahead.

To further show the quality of the work performed in the two cylinders, the diagrams 9, 10, 11, 12, 13 and 14 were taken, in which the indicator barrel was driven independently of the engine. These cards were taken from the locomotive "Cairo," with cylinder ratio of 1 to 2.4. The table gives the data with reference to the cards, and shows the uniformity of the braking power on both sides of the high-pressure piston. The dotted lines represent the pressure on the front side of the piston, while the full lines show the same for the back side. The crank diagrams, A, B, C and D, show the positions of the pistons at the time the wheels commence to revolve. These diagrams will be interesting to our readers, as they are the first of the kind that have been published.

Table of Data relative to Indicator Diagrams showing Braking Power of Compound Locomotive Cylinders.

Number of card.	Mean effective pressure, lbs. per sq. in.	Name of locomotive.	Boiler pressure, lbs. per sq. in.	Cylinder from which card was taken.	Maximum braking effect at back of tender, lbs.	Brake work done per stroke by pistons, ft.-lbs.
1..	54.69	"Port Said"	173	H. P.	.....	21,547
2..	38.24	"	"	L. P.	.....	30,719
3..	64.83	"	"	H. P.	.....	25,569
4..	35.39	"	"	L. P.	.....	28,133
5..	65.18	"	"	H. P.	.....	25,685
6..	37.36	"	"	L. P.	.....	30,016
7..	58.13	"	"	H. P.	.....	22,906
8..	41.32	"	"	L. P.	.....	33,193
9..	.....	"Cairo"	140	H. P.	0 to 6,614	.....
10..	.....	"	140	"	0 to 6,834	.....
11..	.....	"	171	"	0 to 6,014	.....
12..	.....	"	156	"	2,425 to 7,055	.....
13..	.....	"	142	"	0 to 6,614	.....
14..	.....	"	171	"	0 to 6,173	.....

Air Pump for Heavy Suburban and Freight Engines.

To meet the demand which is fast increasing in this country for air pumps of large capacity for long freight trains and heavy suburban work, the New York Air Brake Company has just brought out the air pump shown in the illustration. It is a duplex pump of the same general form as the company's smaller size, which was illustrated in the *Railroad Gazette*, Dec. 6, 1899, except that in the later designs the steam cylinders have been placed below instead of above the air cylinder to reduce the moisture which was found to enter the air cylinder with the piston rod, and to secure better drainage of the steam cylinders.

This large pump has about 70 per cent. greater capacity than the small one. The small one has about the same capacity as the Westinghouse pump in common use. The advantage of one large pump over two small ones is considerable. There are about one-half the number of parts to keep in repair, and one-half the liabilities of failure. Also one large pump uses considerably less steam per cubic foot of air than two small ones, as shown by comparative tests made at Watertown. This pump, with two 7-in. steam cylinders and one 7-in. and one 10-in. air cylinder, uses, by actual experiment, but 20 per cent. more steam than the small pump with two 5-in. steam cylinders and one 5-in. and one 7-in. air cylinder, when pumping 67 per cent. more air under the same steam and air pressures.

The advantages of the duplex action are the same for the large pump as for the small one. Tests at the Watertown shops of the company have shown that by using an air cylinder double the size of the steam cylinder for the first compression of the contents of both cylinders, and then completing the compression with an air piston the same size as the steam piston which actuates it, 50 per cent. more air is delivered each stroke than the volumes of both steam cylinders. In a standard 8-in. pump the air cylinder is 7½ in. diameter and the air delivered is but 88 per cent. of the volume of the steam cylinder.

The valve motion and all parts of this pump are the same as those for the small pump except, as has just been noted, the steam cylinders are at the top. The action of this valve gear was explained in detail in the account of the small pump in these columns, as above noted.

Rapid Transit in New York City.

BY T. GRAHAM GRIBBLE.

Mr. Cooper's article in the *Railroad Gazette* of March 21 is thoughtful, statistical and conservative. It probably voices the opinion of a large number of engineers and it calls for a respectful reply. It will be attempted in the following article to show grounds for holding very different views, not only as to what is most adapted to the public benefit, but as to what is most likely to prove

a good investment. It may be as well to quote the final conclusions of Mr. Cooper's paper:

"That we must have rapid transit, and will have it by some means or other, is certain. If capitalists will not be philanthropic, and build and operate for us a system without expecting a suitable return in earnings, we have the following alternatives:

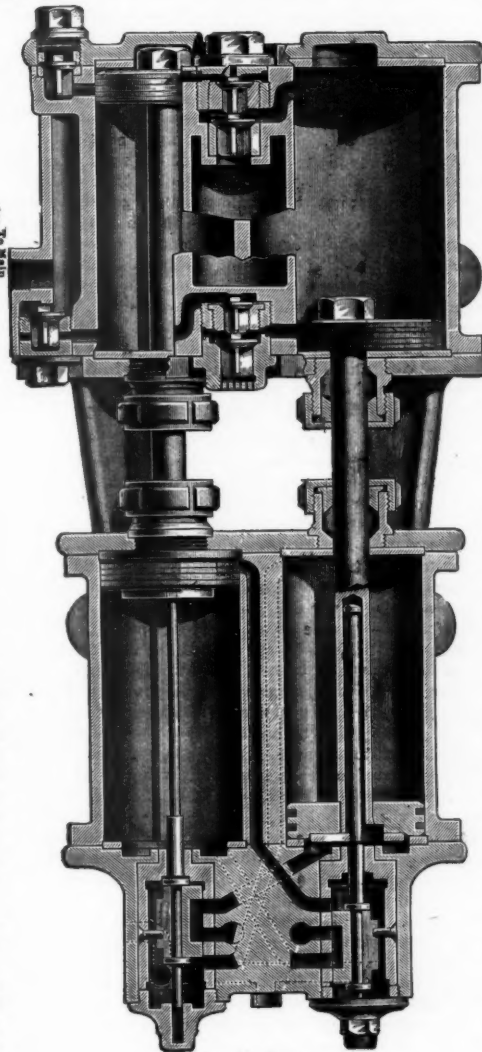
"1. The road must be built and operated by the city, with solely an expectation (or certainty) of a suitable return in the increased value of taxable property.

"2. And which applies more particularly to roads above the surface, the city must assume all damages or cost for real estate, depending again upon the increased values created by such routes as an offset.

"3. The city must make up any deficit due to the operation of any new systems.

"4. The law must make provision for an assessment of betterments and awards for damages or loss.

"5. Public opinion must be changed so as to permit the extension and increase of the elevated railroad system as the only system likely to furnish us with the better accommodations and also make a proper return to the investors."



Duplex Air Pump.

The gist of these conclusions is that outside of the elevated railway system there is no practical solution of the rapid transit problem upon an independent business footing.

If this be so, the Rapid Transit Commissioners will have a comparatively easy task before them but the public will be greatly disappointed.

The objections to the elevated structure are by no means ignored by Mr. Cooper. Those who built them were also alive to their drawbacks, but there seemed no alternative then. Cable traction was in its infancy in San Francisco. Electric railways were unknown. The elevated railway was, with all its faults, a brilliant idea, a daring enterprise from an engineering point of view, and a remarkable instance of the courage of capital in thus embarking upon an unknown financial sea. But if after 19 years there be still no other solution of the question than the occupancy of fresh avenues by these most unsightly erections, it will show a very poor result from the study and experience of so many different methods under every possible variety of circumstances.

The statistical portion of Mr. Cooper's argument that another kind of road would not pay is drawn from a comparison of the London subway with the Manhattan railway. He reduces the present receipts of the company by a certain amount as the effect of competition so as to give every passenger a seat, and he assumes that with the reduced receipts the working expenses would remain the same. This method of calculation is open to three objections.

First.—The capacity of the elevated road is limited by the weakness of the structure, which need not be copied in a new system. If the elevated structure were capable of sustaining engines of 50 tons weight the trains would be of double the capacity. On the system to be presently described the trains might have a seating ca-

capacity of 480 instead of 240 and run from South Ferry to 155th street in 30 instead of 52 minutes. In this way, besides obtaining a double capacity for the road, each car would do 1½ times as much work, because it would make so many more trips.

Second.—It is only theoretically true that a reduction of income involves no reduction in working expenses. How many railroads could pay several per cent. more interest than they do if it were not that they wish to avoid too good a showing, and therefore use a large proportion of their receipts in betterments? It is not suggested that this is so with the elevated, but a method of calculation would be preferable which was not open to this objection. A substantially built underground structure would not require constant repairs, and would therefore yield a large margin of profit.

Third.—The assumption that the normal receipts of a new system would be equal to those of the elevated road when cut down by competition leaves no room for the city's expansion, and loses sight of the fact that traveling facilities create travel. If it be a legitimate proviso that the new system shall be better or at least equally adapted to the wants of the public, then it becomes reasonable to compare the probable results on a basis of relative carrying capacity. For instance, if a route were selected along Fourth avenue or Eighth avenue and a capacity obtained of double that of the elevated road, it would be a fair assumption that at least the same quantity of people would use it as now travel on the elevated road, and every one get a seat.

It may be replied that it is possible to overdo it and provide greater capacity than there is travel now or in the future, but the answer is ready to hand. If we compare the figures on the Manhattan railway of 167,153 in 1872 with 185,833,632 in 1890; if we compare the figures of 9,234,690 on the Brooklyn Bridge in 1884-5 with 35,008,300 in 1889-90 and then take an outlook—what do we see? Proposals before the Legislature for bridging or tunneling the estuaries on a scale so gigantic that the Brooklyn Bridge is dwarfed beside them. The effect of these new links will be to make Manhattan Island the nucleus of a vast city embracing Brooklyn, Jersey City, Newark, Long Island City and all their suburbs. The figures given above represent a gradual, normal development, but here will be, in addition, the sudden creation of a new intercourse. Every one of these facilities for external communication bringing in and out its 30 millions per annum will set those millions in circulation over all the internal means of transit through the day for business, and on into the night for amusement.

Classification of Traffic.

There are three classes of travel which require to be handled in this problem, the express and way service of the city proper and intercommunication between the existing branch lines on the other side of the river and the Grand Central Depot, but the latter is not so urgent as the former. A deep tunnel scheme, such as has been proposed between Brooklyn, South Ferry, and Jersey City, and having a spur track, also in tunnel, to form a connection with the Grand Central Depot, would supply this intercommunication, and would enable people to come from Tarrytown to Wall street inside of an hour. Such a system as this would also transfer baggage and possibly freight, but it would not supply the wants of people traveling to and fro within the island. They need facilities analogous to those afforded by the elevated road, but upon an improved system. However close the way stations of a deep-tunnel line might be made, they would not be sufficiently accessible to be satisfactory for short distances. They would not advertise themselves as the elevated stations do. The way stations on the New York & Harlem Railway handle a very small proportion of the traffic for this very reason. Some are in tunnel and some on viaduct, but they are not adapted to short-distance traveling, and the time-table shows that the company does not attempt to secure it.

The elevated road serves this island fairly well, but it has reached its capacity, and possibly has overstepped it to the extent of shortening its life. The suggestion to make the existing roads into four-track systems, or to build new four-track structures along other avenues, is objectionable on almost every ground. The ironwork of the existing structures was designed for much lighter rolling stock than is being used; any fresh tracks would require new columns in the street, and it is difficult to see where they could be put. Exchange stations would have to be built having four platforms at least 12 ft. each in width, and this would mean the entire roofing-in of the street.

The sum and substance of what the public want is accessibility combined with speed, and the more comfort which may be added to these two essentials the better for the scheme.

Accessibility can be furnished in no other way as well as by a surface railway operated mechanically and acting as a feeder to a more rapid system worked in conjunction with it. The other element of speed could be obtained in the most convenient manner by a subway line directly under the surface line, the cars running at a speed, including stoppages, of about 20 miles per hour, stations being at intervals of about a mile, the co-operation of the two systems rendering it possible to use infrequent subway stations, and, consequently, a lower maximum rate of speed between stations in order to obtain the required average speed.

Many schemes have been proposed from time to time

for an underground railway in this city, but they have failed partly from backwardness of financiers, partly from opposition on the part either of the public or the authorities to the disturbance of the pavements and obstruction of the thoroughfares. The principal difficulty has always been with pipe lines, of which there are a tangled network underneath the pavement sufficient to make any engineer pause and consider. An isometric drawing was lately prepared by Commissioner Gilroy, showing the crossing of Broadway by Fulton street with the pipes exhibited. The various plans of the different companies have shown what they intended to do with the pipes, but not how they proposed to do it, and, foreseeing as the authorities did, the possibility of lively scenes in the thoroughfare when some accident took place with pipes under pressure, it is not to be wondered at that they should give the cold shoulder to the project.

There is, however, something at this present moment very much to be wondered at in the undertakings of the Broadway and Third avenue companies, who have, without any difficulty, obtained permission to change their lines to cable road. They will have the same pipe diversion as if they were making an underground railway, because the average covering is 4 ft. over the pipes, and many of them are much nearer the surface. They will keep open the trenches in the streets to the extent of monopolizing the thoroughfares until the public patience has been strained to its limit, and in the end they will have accomplished comparatively little for their outlay. They will handle somewhat longer distances than they do with the horse car, but the difference of speed down town will not be sufficient, when stoppages are taken into account, to draw many more people. The question naturally occurs as to whether at this critical time of decision as to the way to furnish rapid transit, the Broadway and Third avenue companies are doing the best for the public and themselves. They are going to spend a great many millions, but they certainly will not supply rapid transit. The following list of suggestive facts present themselves when comparing the construction of a combined surface and subway road with that of the cable construction:

1. If an underground railway of two tracks were constructed on any of these avenues, the roof of it could be provided with longitudinal openings, or slots, so that the subway could at the same time serve as the conduit of the surface road, and the extra cost of the two tracks of surface road would be supplied at little more than the cost of the rails. A four-track mechanically operated system would thus be furnished at about the same cost as a double-track elevated road.
2. The construction of the subway might be carried out by means of a corrugated metallic roof, laid down at night, after which all the operations would be performed by the ordinary processes of mining, and form no obstruction to the traffic.
3. The diversion of pipes could be proceeded with by means of suspension rods underpinning the pipes, the rods having heads which would slide laterally between guides in the roof, and having turnbuckles to lift a line of pipe gradually so as not to break the joints. All the work being done underground, any length could be opened up until the pipe was located wherever was most suitable.
4. The whole construction could be completed with very great rapidity, much more quickly than the present cable construction. Adits could be driven at every block from the cross street up to the workings, and the pitmouth be provided with a dumping stage. An almost unlimited number of men could be employed to advantage by letting out each block to a separate sub-contractor, who would have four gangs of men, each of them working from an independent pitmouth.

Motive Power.

Mr. Cooper uses the results upon the London subway as an argument to prove that electricity is not a suitable motive power for handling the business of this city. It is quite possible that he may be right, although that is not the personal opinion of the writer; but, supposing him to be correct in that conclusion, it hardly follows as a consequence that the only suitable motive power is steam.

The cable can certainly be applied with safety to operate any size of train at a speed of 20 miles per hour. It is being run at 15 miles per hour in the suburbs of Chicago now as a surface road. The stopping and starting is quite easy. When applied to a subway with accessible pulleys, protected from the elements, the cable would be worked on conditions more favorable even than those of the Brooklyn Bridge. The careful analysis made by Mr. Thos. C. Clarke, in 1887, of the relative cost of operating the Brooklyn Bridge and the Manhattan Railway, including motive power, maintenance and general expenses, produced results as follows:

	Manhattan. Brooklyn Bdg.
Total cost per passenger-mile.....	2.793 cts. 1.523 cts.
Total cost per train-mile	61.89 " 45.84 "

It is more usual to give statement of cost of motive power alone. Mr. Cooper makes the cost of the Manhattan system 15.55 cents per train-mile. Mr. Kebby, in his paper on cable roads, reported in the February *Journal of the Association of Engineering Societies*, gives for a cable road of 10 miles long and operating 30 trains the cost per car-mile (if sheaves are not lined with babbit) 1.84 cents. Supposing it took eight cable cars to equal the capacity of one Manhattan train, it would still

leave the cost of operating by cable less than that of the Manhattan, even upon a surface road.*

The cost of electric operation is at present considerably more than that of the cable, but the rapid strides that have been made in the improvement of electric motors in the last two or three years are a sure sign that it will soon be a competitor as to price with any other motor. At the same time the rapid transit problem is not a field for experiments, and the proper means of traction would undoubtedly be the cable in the subway. The matter would be readily established if the engineers of the Chicago road and the engineers of the Brooklyn Bridge would give their testimony as to whether the cable could be safely, conveniently and comfortably operated at 20 miles per hour in an underground railway to handle all the traffic which could possibly be expected.

As to the surface road there are several reasons why it might preferably be operated by electricity. The principal one is that being required to stop frequently, and sometimes very suddenly, to avoid accidents, electricity would give a more perfect control. Another reason is that the conduit apparatus of insulators and conductors could be very simple and require much less attention than pulleys. Such a system as the Buda Pesth, recently installed by Siemens, frees the running rails from all current. The conduit system has been a failure in some places on account of the want of accessibility in the conduit when any trouble took place with the insulators; but this would be entirely obviated when the lineman could obtain access to the insulators and give them regular inspection. Another reason for electricity as a means of propelling the surface cars would be the necessity of a plant for lighting the subway which could be furnished from the same power house. Although electric traction is more expensive than cable traction, it pays, even on poorly built roads, for if it not we should not see capitalists pouring their money into electric railways. It is therefore rather a question of what is the best thing for the public than for the company.

Cost and Revenue.

A system such as has been described could be constructed from end to end of the island—that is to say, 10 miles long—for \$17,000,000. This sum would include an allowance of \$2,000,000 for pipe diversions. If the receipts were no more than those of the Third avenue elevated, and the two surface lines, they would yield an interest of four per cent. on \$32,000,000, supposing the expenses to be 75 per cent. of the gross takings. On the Brooklyn Bridge the net revenue is something like 70 per cent. of the total receipts, and as the cable traction of a subway would be under equally favorable circumstances, the above figures would be, provided the road were as popular as the present methods, well within the mark. The various features likely to procure popularity would be, as to the surface road, a better speed than the horse car and a ready means of getting to an express station without walking even half a block; as to the subway there would be a speed greater than that of the elevated road, a well lighted tunnel and access to the stations by half the number of steps needed for the elevated road together with sheltered platforms.

The foregoing arguments are intended to provoke criticism. They have been laid before the Rapid Transit Commission, they have been ventilated at public meetings and they have been talked over with professional men. The publication of them here may result in the suggestion of a much better scheme, but they are the embodiment of the opinion that although the elevated road is a friend to the city which should be made the most of, something more suitable may be devised for new avenues.

The decision of the present Commission will influence the character of the development of this city for all time. If it results in providing the people with what they want without disfiguring the streets, it will have earned their lasting gratitude.

The New Switching Yards and Shops of the Union Pacific at Denver.

The lines of the Union Pacific radiate in every direction from Denver. This, being a great junction point and also having a large local business, requires a good deal of switching of freight trains. There are over 100 warehouses and industries in Denver having tracks connecting with the Union Pacific system. It was found necessary to increase the yard facilities at Denver, and a sort of inside belt line was constructed, known as the "West Side Line," to connect the Fort Worth and South Park roads with the other lines of the system, so that freight trains would not have to pass through the Union depot yards. This new belt line connects with the Kansas and Cheyenne lines at "Jersey," near the eastern city limits, where the new machine shops of the company have been built.

A terminal yard has been constructed at this point, which is shown in the accompanying plan. The main

* Mr. Clark's figures for the cost of motive power alone were still more favorable to cable traction. They were as follows:

	Manhattan.	Brooklyn Bridge.
Cost per passenger-mile of motive power.....	1.169 ct.	0.267 ct.
Cost per train-mile of motive power	25.20 "	8.00 "

Such figures as these require to be met before arriving at the conclusion that the steam locomotive is the only practical method of handling rapid transit.

track of the Cheyenne Division was diverted to one side and two yards laid out, as indicated. The Colorado & New Mexico yard has 11 tracks, capacity 38 cars each. These tracks are laid with three rails, so as to accommodate cars of standard or narrow gauge. The Denver Pacific yard has 12 tracks, holding 33 cars each. It is intended at some future time to construct another yard on the line of the Kansas Division, the location of which is indicated on the plan.

The tracks are spaced 12½ ft. centres, and split switches are used throughout. The yards are arranged to do the switching by the poling plan.

The ground plan of the new shops, nearly completed, is also shown. The new plant comprises a 63-ft. iron turntable, a 50-stall roundhouse, a double-track ash pit for standard gauge engines, a single-track ash pit for narrow gauge engines, a 50,000-gallon water tank, a sand house, a 40-pocket coal chute, an oil house, a store house and office building, 48 × 226½ ft.; a machine shop, 125 × 223½ ft., with annex for engine and boiler room; a blacksmith and boiler shop, 80 × 200 ft.; a paint shop, 50 × 250 ft.; a car erecting shop, 95 × 275 ft., with annex for boiler room, and a transfer table, with pit, 60 × 405 ft. All the buildings, with the exception of the sand house, coal chute and water tank, are of brick and are one story high, except the car erecting shop and office end of the store house, which are two stories in height.

The coal chute is of the Clifton pattern, with pockets on both sides. The track on the north side has three rails so as to allow locomotives of either gauge to take coal. The sand house has two sand driers and two cranes, so that a locomotive on either side can be supplied with sand, by means of a bucket, which is hoisted by the crane. The bucket holds sand enough to fill the sand box, and it has a valve in the bottom by which the flow of sand is controlled. The ash pits are built of stone lined with fire brick, and have steel I-beams to support the rails. The depressed track for loading cinders is placed 6 ft. below the level of the yard tracks. The turntable has masonry walls and the bottom of the pit is covered with concrete. The turntable has four rails for engines of either gauge. The roundhouse is 79½ ft. deep, with inside radius of 135 ft. It has a flat roof and cast iron smoke-jacks. Twelve of the stalls have four rails and four of them have two rails, laid to 3 ft. gauge; the remainder of the stalls have two rails of standard gauge.

The machine shop has ten tracks, each with a pit, with coils of steam heating pipe on the sides of the pit. The erecting room is 62 ft. wide, and is arranged for an overhead traveling crane. The remainder of the machine shop is occupied by machine tools and a tool room. Between the tool room and the boiler room are a wash room and water closet, with ample accommodations for the shop men. The boiler room contains three boilers. The engine room contains a 250 H. P. engine for running the shops and a 100 H. P. engine for operating the lighting dynamos. There is also a 50,000-watt generator for supplying current to the electric motors on the transfer table and electric crane. The transfer table is supported on 12 wheels with masonry walls under the rails, and is operated by a 15 H. P. electric motor. The store house has a space 48 × 60 ft. at one end, fitted up for offices of the Division Storekeeper and Division Master Mechanic. This portion of the building is two stories high; the remainder is one story high, open to the roof, well lighted, with skylights in addition to the side windows, and fitted up with shelving, counters, etc. There is a track on either side, with ample platform room. The blacksmith and boiler shops are separated by a brick wall; the floor is of cinders. An engine and boiler located in the boiler shop furnish power for punches, shears, fans, steam hammers, etc.

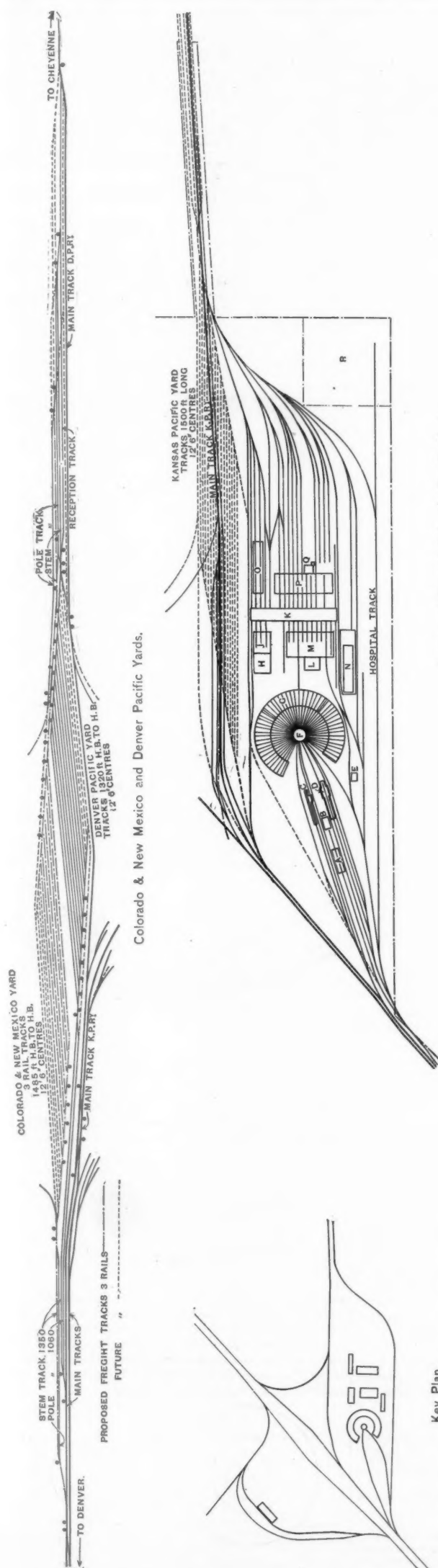
The oil house has eight tanks, of 2,000 gallons capacity each, in the basement, and a number of smaller tanks on the main floor. Oil is issued from the main floor, and is drawn from the large tanks by hand pumps, one to each tank. The track alongside the oil house is elevated, so that oil can be drawn from tank cars by gravity. Pipes and funnels are arranged so that oil from barrels can be emptied into the large tanks either inside the house or on the platform. The house is built of brick and stone, and the floor is of brick arches and concrete, supported on I-beams. The roof is of asphalt and gravel, and all openings are provided with iron shutters.

The car-erecting shop is two stories high, and has a large skylight on the ridge, and a well hole 20 ft. wide admitting light to the lower floor. A space 90 × 95 ft. at one end is partitioned off by a brick wall running through to the roof. In this space is placed the wood-working and bolt-cutting machinery. The second floor is intended for upholstering and cabinet making work.

The paint shop has two tracks running through it, and has a cement concrete floor. There is a large skylight on the ridge, so that the space between tracks is well lighted. It is the intention to build a freight car repair shop east of the car-erecting shop. Tracks for storage of cars will be laid in the space on the south of the store house.

In the southeast corner of the grounds is the Union Pacific Hospital, erected by the company for the benefit of the employes.

The buildings have a complete sewerage system connecting with the city sewers. A system of 6-in. and 8-in. water pipes supplies all the buildings with water, valves being placed so that each boiler room can be supplied in either of two ways. Numerous fire hydrants convenient



Shops and Proposed Kansas Pacific Yard.
A, Coal Chute; B, Sand House; C and D, Ash Pits; E, Oil House; F, Turn Table; G, Engine House, 50 stalls; H, Blacksmith Shop; J, Boiler Shop; K, Transfer Table; L, Engines and Boilers; M, Machine Shop; N, Store and Office; O, Paint Shop; P, Car Shop; Q, Boiler Room; R, Hospital Grounds.

SWITCHING YARDS AND SHOPS OF THE UNION PACIFIC AT DENVER.

ly located give ample protection against fire. Water is supplied from an artesian well 680 ft. deep, which will furnish 150,000 to 200,000 galls. per day, of excellent water. The pipe system is also connected with the city water mains, so that in case of fire the city pressure can be turned on immediately.

Numerous tracks are conveniently arranged for "bad order" cars, and for standing room for engines ready to go out.

The yards were planned and built by Mr. Thomas Appleton, lately Engineer of Bridges and Buildings of the Union Pacific. The shops were also planned by Mr. Appleton under the direction of Mr. Geo. W. Cushing, late Superintendent of Motive Power, and were erected under his supervision, with Mr. H. C. Relf as engineer in charge.

All the buildings are heated by steam and lighted by incandescent electric lights. Thomson-Houston system. The turn-table was built by the Edgemoor Bridge Works and the transfer-table by the Industrial Works of Bay City, Mich. Roe's cast-iron smokejacks are used.

B. Lantry & Sons were contractors for the round-house, coal chute, ash pits, etc., and N. C. Chapman was contractor for other buildings.

Train Accidents in the United States in February.

COLLISIONS.

REAR.

3d, on Pennsylvania, at Braddock, Pa., a freight train ran into the rear of another freight, derailing and throwing the caboose over an embankment. Two trainmen and 2 men in charge of freight were injured.

4th, on Central of Georgia, near Waynesboro, Ga., a passenger train ran into some cars of a freight train which had been left on the main track, wrecking 2 of them and disabling the locomotive. One trainman injured.

4th, on New York, Lake Erie & Western, at Port Jervis, N. Y., a freight train collided with some cars standing on the main track, damaging several tank cars so that their contents ran out upon the ground. A brakeman was injured in jumping.

4th, on Cincinnati, Hamilton & Dayton, near Glendale, O., a passenger train collided with some box cars which had been left standing on the main track by a disabled freight train. Engineer injured.

4th, on Wabash, near Renick, Mo., a freight train broke in two and the detached sections collided, badly injuring 2 trainmen.

4th, on Cleveland, Lorain & Wheeling, near Beach City, O., a coal train which was stalled on a grade was run into by a following freight train, wrecking the engine, caboose and a number of coal cars. One trainman killed and 2 tramps injured.

5th, at 6:30 p. m., on Lehigh Valley, at Coxtown, Pa., a freight train which had stopped to do some switching was run into at the rear by a shop train, consisting of engine and one car, killing 1 and injuring 2 employees riding on the pilot of the engine.

5th, on Pennsylvania, near New Florence, Pa., second No. 7, consisting of mail, express and baggage cars, ran into the rear of a freight train which had just pulled out

of a siding, the crew of which mistook a local passenger train following first No. 7 for second No. 7. Engine and several cars badly damaged. Engineer and fireman injured.

7th, on East Tennessee, Virginia & Georgia, at Cleveland, Tenn., a freight train ran into the rear of another freight, damaging engine and several cars. One brakeman was killed and 3 other trainmen were injured.

8th, on Pennsylvania, near Leaman Place, Pa., an east-bound passenger train ran into the rear of a freight train, wrecking the caboose and several cars and jamming the tender into the mail car. Engineer badly hurt. There was a dense fog at the time.

9th, on Wabash road, near Huntsville, Mo., a passenger train ran into the rear of a freight train, doing considerable damage. A fireman was badly injured by jumping, as was also a man who had been sleeping in the caboose.

9th, on Savannah, Florida & Western, at Folkstone, Ga., a freight train ran into the rear of a passenger train, damaging the rear sleeper. Engineer and fireman injured. A dense fog prevailed at the time.

14th, on Illinois Central, near Kensington, Ill., a freight train ran into a preceding freight, piling up the engine and 13 cars. Fireman seriously injured.

15th, on New York Central, near Savannah, N. Y., a freight train ran into the rear of another freight, wrecking the caboose and following car, containing valuable horses, a number of which were killed. A stockman in the caboose was injured.

15th, on West Shore, at Jordan, N. Y., a freight train broke in two and the detached portion was run into by a following freight, wrecking the caboose and 4 cars, one of which caught fire and was burned up. A brakeman was badly injured.

16th, on Union Pacific, between Cheyenne and Denver, a special train ran into the rear of a freight train, killing a fireman and injuring 3 other trainmen.

16th, on New York Central & Hudson River, near Churchville, N. Y., a freight train broke in two on a descending grade, and the rear section afterward ran into the forward one, wrecking 5 oil tank cars, the split oil in which was ignited and the entire train burned up. The engineer was badly burned.

16th, at Albion, Pa., a Lake Shore & Michigan Southern freight train ran into the rear of a Pennsylvania company freight on the bridge over Conneaut Creek, the engine and 16 cars of the former being derailed and thrown into the creek. One trainman killed and another severely injured.

16th, night, on Delaware & Hudson, at Steel Mill Station, Pa., a freight train which had stopped to discharge freight was run into by a following freight, derailing 12 cars, two of which were thrown upon and demolished an adjacent dwelling, injuring 2 occupants.

16th, on Seaboard and Roanoke, near Portsmouth, Va., a construction train ran into the rear of a passenger train. Eight trackmen were injured by leaping from the cars.

17th, 5 a. m., on Pennsylvania, at Rahway, N. J., a fast newspaper train ran into the rear of a freight train which had been stopped by the breaking of a coupling, wrecking the engine and express car and six cars of the freight. Engineer, fireman and express messenger badly injured. The operator at the entrance of the block section in which the collision occurred, notified the other end that the freight train was on the fourth instead of the third track, and the last-named operator therefore reported this section as clear while the freight was still within it.

18th, on New York Central & Hudson River, near Schenectady, N. Y., a freight train which had come to a standstill was run into at the rear by an empty engine, damaging the caboose and injuring a brakeman.

20th, 7:06 a. m., on New York Central & Hudson River, near 80th-street station, New York City, northbound passenger train No. 10, of the New York, New Haven & Hartford road, ran into the rear of a preceding train of empty cars traveling from the Grand Central Station to the Mott Haven yard, killing 6 and injuring 7 employees and injuring 2 passengers. The New Haven train was running about 30 miles an hour, and the other very slowly, the train being heavy and the engine hardly capable of taking it up the grade. The New Haven locomotive was not much damaged, but the cars struck by it were telescoped, and 2 or 3 of them badly wrecked. Fire immediately broke out in one of them, and several of the employees, most of whom were car cleaners, were burned to death. The fire was soon extinguished by the city Fire Department, which was promptly called. The morning was very foggy, and the evidence taken before a coroner's jury says that the New Haven train ran past a distant signal showing caution and a home signal showing danger at the entrance of the block in which the empty train was traveling, though the engineer claims that the signals showed all clear. Immediately after the collision a southbound empty engine on the adjoining track ran into the wreck and was derailed, but the men upon it escaped. This accident was described in the *Railroad Gazette* of Feb. 27 and March 6 and 13.

24th, at 6:30 p. m., on Philadelphia & Reading, near Gordon, Pa., a freight train descending a grade became uncontrollable and collided with three empty engines which had been stopped close together by a disabled freight train ahead. Four engines were badly damaged, as were also 3 box cars and a number of tank cars. Spilt oil was ignited by hot coals scattered from the engines, causing the tanks to explode, burning the greater portion of the wreck. Three trainmen injured.

25th, on Chicago, Rock Island & Pacific, near Eddyville, Ia., a freight train which had stopped at a water tank was run into by a following freight, making a bad wreck and killing an engineer.

27th, on Milwaukee & Northern, near Ellis Junction, Wis., a freight train broke in two, and the detached sections collided, derailing a car and killing 12 horses.

And 21 others on 18 roads, involving 16 passenger and 24 freight trains.

BUTTING.

1st, on Colorado Midland, near Granite, Col., butting collision between two freight trains, caused by the crew of one of them misreading a new time table, which has gone into effect the day before. A fireman was killed and several other trainmen injured.

1st, on Union Pacific, near Dillon, Mont., butting collision between a northbound passenger train and a mixed train. Fireman killed and engineer fatally injured.

3d, on New York, Pennsylvania & Ohio, near Corry, Pa., butting collision between two freight trains during a heavy snowstorm, in which 2 trainmen were killed and 3 injured.

6th, on Louisville & Nashville, at Belleville, Ill., collision between two passenger trains on a trestle, doing slight damage. Engineer hurt.

7th, on Central of Georgia, at Green's Cut, Ga., butting collision between two freight trains, killing a conductor.

8th, on Atlantic & Pacific, near Angell Station, Arizona, butting collision between two freight trains. One of the engines was overturned, killing the engineer.

11th, about 5:35 a. m., near Ingleside, Mo., butting collision between a St. Louis, Keokuk & Northwestern northbound construction train, consisting of engine and 5 cars and a Wabash southbound special, running caboose foremost. The caboose and the work train, engine and several following cars were badly wrecked. The Wabash engine, though considerably damaged, broke away from its tender and ran unattended a distance of 2 miles before steam was exhausted. Two trainmen killed and 4 injured.

13th, on Burlington & Missouri River, at Lincoln, Neb., butting collision between a freight train and a switching engine, wrecking both engines and a number of cars. Two trainmen injured.

14th, on New York, Lake Erie & Western, at Susquehanna, Pa., collision on a curve between an empty engine and a yard engine carrying the night gang of yardmen, 10 of whom were injured, 2 fatally.

19th, on Baltimore & Ohio, near Washington, Pa., butting collision between a passenger train and a freight train, doing some damage. Several passengers slightly injured.

20th, on Ohio & Big Sandy, at Mitchell's, Ky., butting collision between a passenger train and a mixed train, due to the latter running on the other train's time. Engines and several box cars damaged.

20th, on Texas & Pacific, at Tioga, Tex., a passenger train ran over a misplaced switch and into the head of a freight train standing on a side track, badly damaging both engines and injuring 2 trainmen.

20th, on Atchison, Topeka & Santa Fe, at Shoemaker, N. M., butting collision of freight trains, due to a misunderstanding of orders, wrecking both engines and 8 cars. Two trainmen killed and another injured.

20th, about 2 a. m., on East Tennessee, Virginia & Georgia, near Dixie, Ala., butting collision between two freight trains, wrecking the engines and 6 cars. Several trainmen were slightly injured and 2 tramps killed.

20th, on Cleveland, Lorain & Wheeling, near Massillon, O., butting collision on a curve between a southbound passenger train and a gravel train, due to a misunderstanding of orders. Both engines were damaged and 2 trainmen injured.

25th, on Ohio Valley road, at Waverly, Ky., butting collision between a passenger train and a freight, disabling both engines and slightly injuring several passengers.

25th, on Deadwood Central, near Pluma, S. D., butting collision between a Deadwood Central construction train and a Burlington & Missouri River freight train, on a heavy grade. The collision was very slight. Both engines had been reversed and abandoned. The construction train ran back down grade uncontrolled for a quarter of a mile, when it was derailed and went into the ditch, injuring 7 employees, 1 perhaps fatally.

29th, on Deadwood Central, near Deadwood, S. D., butting collision between passenger train and switching engine, damaging both locomotives and 2 coaches, and injuring 3 trainmen.

27th, at East Buffalo, N. Y., butting collision between a Lehigh Valley passenger train and a New York, Lake Erie & Western special freight, due to a misplaced switch. A brakeman was killed and 4 other trainmen injured.

28th, on Georgia Southern & Florida, at Tifton, Ga., a passenger train ran over a misplaced switch and into the head of a freight train standing on a siding. Both engines were badly damaged, 1 trainman killed, and 2 trainmen and several passengers slightly injured.

And 5 others on 5 roads, involving 2 passenger and 8 freight trains.

CROSSING AND MISCELLANEOUS.

3d, on New York Central & Hudson River, at East Rochester, N. Y., collision between a passenger train running at speed and a locomotive coming out of a roundhouse, badly damaging both engines and several cars. An engineer was killed and a fireman severely injured.

4th, on Lake Shore & Michigan Southern, at Ripley, N. Y., a fast freight train ran into the side of the forward portion of a freight backing into a side track, wrecking both engines and a number of cars, and killing a fireman.

8th, at a crossing in Chicago, collision between a Pittsburgh, Cincinnati, Chicago & St. Louis freight train and a Belt Line engine, wrecking 6 tank cars loaded with oil, which were burned up. Engineer injured by jumping.

10th, about 9:30 p. m., on Delaware, Lackawanna & Western, near Mount Morris, N. Y., a passenger train running at speed ran into an engine going through a crossover track, but which was not clear of the main track. Both engines were badly wrecked, the train engine overturned and 2 express cars damaged. Two trainmen killed and 3 injured.

13th, at a crossing in Mineola, Tex., a Missouri, Kansas & Texas passenger train collided with the rear portion of a freight train which had broken in two and run back down grade. Engine and a number of freight cars damaged. One trainman injured.

14th, on Missouri, Kansas & Texas, near Colbert, Tex., a freight train broke in two, but the fact was not discovered by the trainmen on the forward portion until it reached the next station, Colbert. The engine in returning for the detached portion collided with two cars which had broken away from it and run down grade, badly damaging both and the tender of the engine. A brakeman was killed.

15th, at the crossing near Columbus, O., a southbound Columbus, Hocking Valley & Toledo passenger train ran at full speed into the engine of a Scioto Valley freight train during a dense fog, doing considerable damage. Two trainmen and several passengers were injured.

16th, on Pennsylvania, at Philadelphia, Pa., some oil tank cars in a switching freight ran away and collided with some other tank cars, wrecking several of them and causing one to explode. The scattered oil caused 3 other cars to explode in rapid succession, burning a number of coal cars, a switchman's shanty and several other small buildings. A bystander in fleeing from the first explosion had his leg broken.

16th, on Union Pacific, at Ogden, Utah, a yard engine ran over a misplaced switch and into the side of the smoking car in a passenger train moving on the main track, knocking it off its trucks. One passenger slightly injured.

18th, on Lehigh Valley, at Allentown, Pa., collision between a construction train and a locomotive hauling a passenger car. The latter was overturned, severely injuring a brakeman.

23d, on Baltimore & Ohio Southwestern, at Remington, O., the rear car of a sidetracked passenger train, which did not clear the main track, was struck and thrown over on its side by a passenger train moving in the opposite direction, injuring a conductor and 3 passengers.

And 10 others on 10 roads, involving 1 passenger and 12 freight trains.

DERAILMENTS.

DEFECT OF ROAD.

5th, on Louisville & Nashville, near Shelby, Ala., a bridge gave way under a freight train, 5 loaded stock cars falling with the structure. Three trainmen killed.

5th, on St. Louis, Iron Mountain & Southern, near Alma, Ark., a passenger train was derailed by the breaking of a fishplate, all the cars being thrown into the ditch except the smoking car, which was thrown diagonally across the track. Two trainmen and 2 passengers injured.

9th, on Burlington, Cedar Rapids & Northern, near Randall, Ia., all the cars of a passenger train, running at speed, were thrown from the track by a broken rail and overturned in the ditch. The mail car was set on fire by the stove, and nearly all the cars were burned up. Four trainmen and 15 passengers were injured, 4 of the latter seriously. The train was heated by steam from the locomotive, but a mail clerk at work in the car while it was standing on a siding at Cedar Rapids had started a fire in the stove.

12th, on Atlantic & Pacific, near Cadiz, Cal., the two rear cars of a passenger train were thrown from the track by a broken rail and overturned. Fire broke out and the cars were burned up. Several passengers were badly bruised.

16th, on Kansas City, Memphis & Birmingham, near Townley, Ala., a freight train broke through a trestle and 8 cars were wrecked.

18th, on Illinois Central, near Milan, Tenn., several cars of a passenger train were derailed by a broken rail and thrown off a trestle. Soon afterward a following freight train ran into the rear of the passenger train, throwing several more cars into the ditch. Fire broke out and burned the wreck. The baggage car was killed and 4 trainmen and 4 passengers were injured.

20th, on Central of Georgia, at Sterritt's Station, Ga., a freight train was thrown from the track by the spreading of the rails, injuring several trainmen.

20th, on Pittsburgh, Shenango & Lake Erie, near Greenville, Pa., a bridge which had been weakened by a freshet gave way under a coal train, a portion of it going down into the creek.

27th, on South Carolina road, near Blackville, S. C., caboose and one coach of a mixed train were derailed by the spreading of the rails and thrown over on their sides. Two trainmen injured.

27th, on Central of Georgia, near Fort Gaines, Ga., a car of a passenger train was derailed by the spreading of the rails and badly damaged, injuring conductor and 4 passengers.

28th, night, on Great Northern, in Minneapolis, Minn., 9 cars in a freight train loaded with lumber were derailed at a defective switch and wrecked, injuring 2 trainmen. One of the cars took fire and was burned up.

And 6 others on 6 roads, involving 3 passenger and 3 freight trains.

DEFECTS OF EQUIPMENT.

3d, on Cleveland, Canton & Southern, near Cleveland, O., engine of passenger train exploded its boiler, killing engineer and fireman and derailling one of the cars.

5th, on Norfolk & Western, near Luray, Va., 9 cars of a freight train were derailed and badly damaged by a car loaded with pig iron breaking down. Two trainmen and another employee injured.

25th, at 3:50 p. m., on Pittsburgh, Cincinnati, Chicago & St. Louis, at Hagerstown, Ind., a passenger train was derailed, while running rapidly, by the breakage of a side-rod, or some other part of the locomotive running gear. The entire train was derailed and ran some distance on the sleepers, when the last 3 cars were overturned down a 15-ft. embankment and badly wrecked. Fire broke out, but it was soon controlled. Conductor, 2 officers of the road and 1 passenger were killed, and 3 trainmen and 26 passengers injured.

And 10 others on 9 roads, involving 3 passenger and 7 freight trains.

NEGLIGENCE IN OPERATING.

13th, on Michigan Central, at St. Helen's, Mich., some cars in a switching freight loaded with logs ran over a misplaced switch and crashed into a roundhouse, killing an employee and badly injuring 2 others.

19th, on Memphis & Charleston, at Memphis, Tenn., an engine was backed off the end of a coaling trestle and wrecked, killing 1 trainman and injuring another.

21st, on Western & Atlantic, in Chattanooga, Tenn., a car of a switching freight train was thrown off the end of the track and against an adjacent building, partially demolishing it and injuring 1 of its occupants.

And 2 others on 2 roads, involving 2 freight trains.

UNFORESEEN OBSTRUCTIONS.

5th, on St. Louis, Arkansas & Texas, near Stuttgart, Ark., a passenger train ran over a horse, derailling the forward portion of the train, killing the fireman and injuring 4 other trainmen.

13th, on Memphis & Charleston, near Tusculum, Ala., a freight train ran over a cow which had got caught in a cattle guard, and the engine was derailed and overturned, badly injuring the fireman.

17th, on Chesapeake & Ohio, at Dawson, Ky., a freight train ran over a pair of oxen, and the engine and three cars were derailed and damaged. Engineer and fireman injured.

21st, on Allegheny Valley road, near Franklin, Pa., a freight train ran into a landslide, wrecking the engine and 10 cars. Fireman killed and two other trainmen injured.

23d, on Pennsylvania, near Milesburg, Pa., engine of a passenger train was derailed and overturned at a switch which had been maliciously obstructed. Fireman killed.

26th, on Atchison, Topeka & Santa Fe, near San Marcial, N. M., a freight train was derailed by a boulder which had rolled down upon the track, wrecking the forward end of the train. One trainman killed and 1 badly injured.

27th, on Denver & Rio Grande, near Grand Junction, Col., a freight train ran into a rockslide, derailling engine and 1 car. The engine was thrown over a high embankment and wrecked, badly injuring the engineer. The fireman leaped into the Gunnison River and escaped injury.

And 8 others on 7 roads, involving 3 passenger and 5 freight trains.

UNEXPLAINED.

2d, on Savannah, Griffin & North Alabama, near Griffin, Ga., a passenger train was derailed on a curve and the locomotive and several cars were badly damaged, injuring 11 passengers and 3 trainmen.

3d, on Central of Georgia, near Woodlawn, S. C., a freight train broke through a trestle, injuring a trainman and 3 passengers riding in the caboose. It is

thought that a derailed car caused the trestle to give way.

3d, on Indiana Midland, near Lebanon, Ind., a passenger train moving at high speed was derailed, doing some damage and injuring several passengers.

4th, on Bellaire, Zanesville & Cincinnati, near Bellaire, O., a car of a passenger train was derailed and thrown over an embankment, badly injuring conductor and 5 passengers.

10th, on Western North Carolina, near Connelly Springs, N. C., a freight train was derailed and 6 cars wrecked, injuring 3 trainmen.

11th, on Maine Central, near Olamont, Me., a passenger train was derailed and several passengers were injured by jumping off.

11th, on Union Pacific, at Omaha, Neb., a switching engine was derailed and overturned, badly injuring an engineer and 2 switchmen.

12th, on Atlantic Coast Line, near Athens, Ga., several cars of a freight train were derailed and damaged. Brakeman severely injured.

13th, on Virginia Midland, 20 miles south of Rocky Mount, Va., a freight train was derailed and several cars wrecked, killing a trainman.

16th, on Richmond & Danville, near Newton, N. C., a mixed train was derailed on a trestle, causing it to give way, falling 30 ft. and making a very bad wreck. Fireman and 2 passengers killed and 6 others injured, 3 of whom have since died.

18th, on New York Central & Hudson River, near South Dover, N. Y., engine and 2 foremost cars of a passenger train were derailed and ditched, injuring several trainmen.

23d, on Union Pacific, near Cascade Locks, Or., a west-bound passenger train was derailed on a trestle, and 2 coaches and a mail car were tipped off, injuring a number of passengers.

27th, on Central Vermont, at Sheldon, Vt., a passenger train was derailed and 2 cars ditched. Two passengers slightly injured.

28th, on Southern Pacific, near Wharton, Tex., 7 cars of a freight train were derailed and wrecked, injuring a brakeman.

And 29 others on 26 roads, involving 5 passenger and 24 freight trains.

OTHER ACCIDENTS.

6th, on Western & Atlantic, at Marietta, Ga., engine of a freight train exploded its boiler, injuring the fireman.

10th, on Cumberland Valley road, near Martinsburg, W. Va., a passenger train ran into a large rock which had rolled down upon the track, tearing away the cow-catcher and damaging the express and baggage cars.

16th, on Pittsburgh, Cincinnati & St. Louis, near Pittsburgh, Pa., the third car of a passenger train was struck at the side and crushed by a large stone, which had been dislodged from a high hill by a freshet. One passenger was instantly killed and 3 others injured.

23d, on Cleveland, Cincinnati, Chicago & St. Louis, near Windsor, Ill., engine of passenger train exploded its boiler, fatally scalding the engineer and injuring the fireman.

And 6 others on 5 roads, involving 3 passenger and 3 freight trains.

A summary will be found on another page.

The Gibbs Steam Hose Coupling.

The steam hose coupling for railroad trains shown by figs. 1, 2 and 3 is one which is now being extensively used on the Chicago, Milwaukee & St. Paul, the Baltimore & Ohio and other roads; it is known as the Gibbs

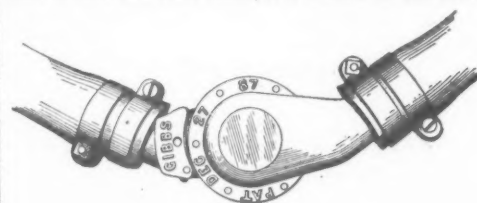


Fig. 1.

coupling, and was invented by Mr. Geo. Gibbs, Mechanical Engineer of the Chicago, Milwaukee & St. Paul, where it is used to connect the overhead steam pipes. The form here shown is the latest for 1½-in. opening.

Fig. 1 shows the couplers coupled together. Fig. 2 shows the coupling faces and the method of holding the diaphragm, also the lugs which interlock and form the

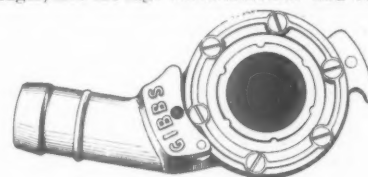


Fig. 2.

coupling proper. Fig. 3 shows the diaphragm and metal washer. It will be seen that the diaphragm is flanged into the washer at the centre, and a lip on the washer is thereafter bent down over the flange of the diaphragm, thus securely holding it in position. By means of the ring shown in fig. 2 the joint faces made of hard vulcanized rubber are held to the diaphragm.

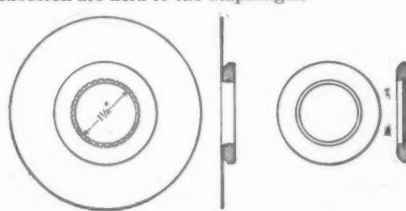


Fig. 3.

This coupling has withstood the test of four winters on the St. Paul road, and has many desirable features. The following are the claims made for it: It has a steam

tight joint in which the tightness is increased by the increase of pressure. It is durable, simple in construction, conveniently handled, and easily repaired or replaced. It automatically uncouples in case a train parts, and has a take-up for wear. It also can be made at an extremely low cost. It is an important fact that this coupling is similar in operation to the Westinghouse coupling, and trainmen understand it at a glance.

The opening in this coupling is larger than ordinarily made, being $1\frac{1}{2}$ inches in diameter. The agents are the Safety Car Heating & Lighting Company, New York City.

Improvements in Locomotive Boiler Construction.*

Mr. Hickey first spoke of the qualities and defects of iron boiler plate, and said it was seen by manufacturers of boiler iron that a superior quality, or a most radical change in the process of its manufacture, was necessary. This led to the consideration and use of steel plate, and in comparing the properties of steel and iron for this purpose, there can be no dispute that the nature of the process employed in the production of steel is immensely superior to that employed in the manufacture of wrought iron, so far at least as obtaining a uniform and cohesive texture in material is concerned.

A gentleman connected with the manufacture of steel boiler plate recently said that, as a rule, persons wanted steel of a very high tensile strength for their boiler plate, but from repeated tests which he had made of steel before and after a period of service, he was of the opinion that a plate having a tensile power higher than 55,000 lbs. for fire sheets and 60,000 for shells is unnecessary.

Toughness of material and a high elastic limit are

ters and reduces the strength of the shell at that point. The longitudinal tie rods connecting the boiler head and front tube sheet are quite as effective and less expensive.

The plate on which is located the dome is $\frac{3}{16}$ in. thick, all the others being but $\frac{1}{4}$ in., the throat sheet alone being in thickness $\frac{3}{8}$ of an inch.

The tubes are situated in vertical rows, to the end of permitting a good circulation and a free escape of the heated currents on their way to the steam space, and of permitting also a freer passage for the impurities of water to reach the bottom of the boiler, where they can be removed. It is true that with this manner of locating tubes a less number is had than is admissible in a sheet where they are placed zigzag; but experience has shown that what heating surface is lost by the less number is far more than gained by the advantages just named.

The number and relative situation of tubes in a locomotive boiler should receive, it seems to me, much consideration. While discussing boiler tubes, it may be well to consider the diameter of tubes best suited to the consumption of bituminous coal. Custom perhaps has somewhat established the almost universal use of tubes 2 in. in diameter. It appears to be an unsettled question, however, whether this diameter has been reached from tests made and the results of experience, or whether custom alone has settled the matter. Something, no doubt, can be said in favor of the use of tubes of both larger and smaller diameters. It is claimed for tubes of $1\frac{1}{2}$ and 2-in. diameters that, from the increased number which can be placed in equal areas of tube plates, the heating quality of the boiler is augmented because of a better distribution of the heated currents. On the other hand it is claimed for tubes of $2\frac{1}{4}$ and $2\frac{1}{2}$ in. diameter that they are not as liable to stop up with the coal of commerce as 2-in., and that they will conduct heat of higher temperature a greater distance through the tube-way than tubes of smaller diameter. In the absence of

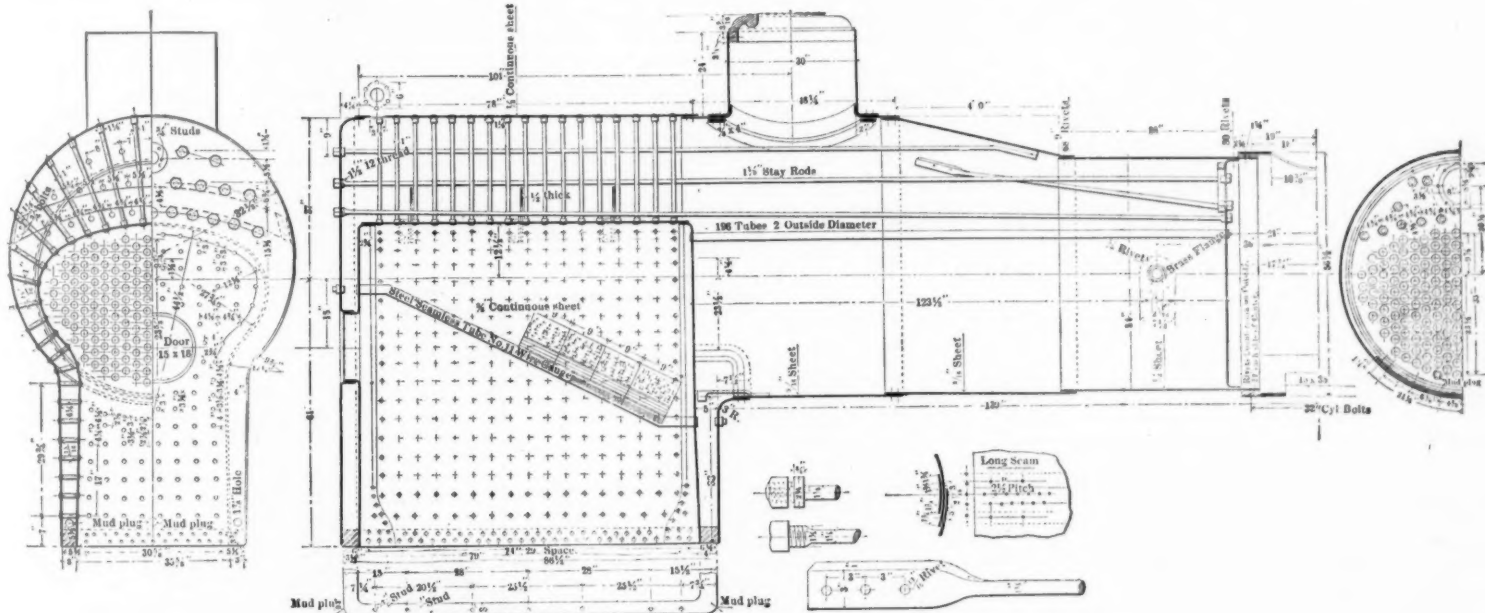
larly so, if it is not perfectly and fully covered with non-conducting material to protect it from the surrounding atmosphere. Sufficient steam room between the surface of the water and the shell is a far more desirable place in which to store steam. Domes, of course, afford a convenient means for throttle valves and other attachments, but they should be no higher than is absolutely required.

I am aware that mud drums on locomotive boilers have been used in years past, but are now generally discarded, the reason given for this action being that they have been a source of weakness to the boiler without corresponding gain. It appears to me that in districts where feed-water is largely charged with corrosive properties or foreign substances of any kind, the expense of attaching and maintaining mud drums would be a good investment, not only for removing the boiler deposit, but for the purpose of inspection.

The drawing of the boiler here shown is intended for a mogul engine having cylinders 18×24 in., the boiler carrying a service pressure of 165 lbs. to the sq. in. The total area of the inside of this boiler is 255 cu. ft.; the space occupied by the water $188\frac{1}{2}$ cu. ft., and the steam space $66\frac{1}{2}$ cu. ft., or the steam room area about 26 per cent. of the total. With ordinary height of water when in service the boiler will contain 1,410 gallons.

It is customary of recent years in some sections to construct the furnace of locomotive boilers quite shallow. Now, this might be justified when a combustion chamber is introduced between the surface of the fire and the tube sheet, but it is difficult to realize how economical results can be obtained otherwise from this method of construction. Allowing a proper body of fuel on the bars, there can be but little distance between the fire and the tubes, and under the influence of a rapid draught, where is the opportunity of gas making, gas heating, mixing with the air, maintaining high temperature and other elements for proper combustion.

Periodical testing of boilers should never be overlooked.



DIAGRAMS TO ACCOMPANY MR. HICKEY'S PAPER ON BOILER CONSTRUCTION.

features of great importance in boiler plate, particularly to plates exposed to frequent changes of temperature. Experience has shown that steel boiler plate, in order to render the best of service, should be of the mildest quality, containing such a low percentage of carbon as to be incapable of acquiring any degree of temper when heated and suddenly cooled.

The tensile strength of the plate, however, or the tearing strain of seams, may not be the elements limiting the strength of a boiler. Its power of resistance is the measure of its weakest point. Poor workmanship, insufficient or improper bracing, may cause a weakness sufficient to endanger it, while other parts possess the qualities of highest strength. The importance of improved design therefore, and the necessity of good workmanship, cannot be too strongly urged, and the existing and growing feeling for higher boiler pressure is a factor absolutely requiring these.

In the drawings of the boiler accompanying this paper, no great departure from design of recent construction is claimed. The drawing is appended simply for the purpose of calling attention to a few points that, without it, could not well be illustrated.

In the absence of crown bars, it will be noticed, a system of radial stays is introduced, thus increasing the water space and adding materially to the heating efficiency of the crown sheet. With this method the strength of the parts is not in the slightest reduced, but, rather, increased. The wagon top part of the boiler is extended for the purpose of placing the dome at a point where the interior of the boiler is accessible, and of obtaining the advantages of enlarging the steam space. The outer sheet of the firebox is seamless from the point of its junction with the foundation bar on one side to that on the other, thus doing away with the necessity of joints in the sheet. Its circular form is also a feature of strength. The inner sheet of the firebox is also without longitudinal seams, except at the foundation bar, and is slightly crowned, for the double purpose of increasing its crushing resistance, and permitting, to some degree at least, a better line of connection for the radial stays between it and the shell.

In order to support the boiler head, it is customary in some quarters to introduce stay rods, making a diagonal connection between the head and shell, instead of the long rods usually placed to brace the boiler head and front tube sheet. The principal objection to the diagonal supports is the additional holes in the shell which must be placed there for their attachment, and which, together with the holes created for the radial stays, frit-

any reliable data on this question, from which conclusions of value could be reached, I incline to the opinion that, under the conditions of operating locomotives in this western country, tubes of $2\frac{1}{4}$ in. diameter would give fully as good results in boiler efficiency as tubes of smaller areas of opening, and would be less liable to stop up.

It is true that the heating surface may be increased in proportion to the number of tubes, but, as heretofore stated, it is not always true that the heating power of the boiler is increased thereby. If an increase in the evaporative power of a boiler becomes necessary there are two conditions which must be observed strictly: 1st, increase of heating surface, and 2d, a sure means of permitting a free water circulation to the point where the heat thus presented can be absorbed.

It is, therefore, clear that a simple increase in the number of tubes will not add to the efficiency of the boiler unless the other condition is observed. Aside from the evil tendency of the smaller tubes to stop up, when using ordinary soft coal, owing to smaller orifices presented to the heated currents, the body of the flame and its intensity and temperature is reduced, and, unless complete combustion takes place in the fire-box, the result must be the escape of unconsumed gases, with consequent waste of heat. With the use of larger tubes the flame enters in larger volumes, thus retaining for a longer period its intensity, and prolonging the action of combustion as before stated, permitting the entrance of heat of a higher temperature to a greater distance through the tubes.

It has been observed that flame never enters a tube of ordinary size more than a few inches, no matter how near the tubes are placed to the surface of the fire, but in smaller tubes the flame distance is necessarily less than in larger ones.

In cases where radial stays have been substituted for crown bars, the swash or surging action of the water in the boiler has given some trouble, due, no doubt, to the sudden stops at times made by trains of high speed. To counteract this, we have introduced plates reaching across the boiler at a point about 5 in. above the crown sheet, and attached by angle irons to the outer sheet, the purpose of the plates being to retard and quiet the action of the water when under the influence stated.

It is the opinion of many that the dome is a means of supplying dry steam to the cylinders. Now, while this may be a fact when the domes are located only a short distance from the heating surface, it is not true when the domes, as in the case of many boilers, are located some distance therefrom. The fact is that a high dome situated some distance from the heating plates, instead of furnishing dry steam to the cylinders, as is usually expected, delivers steam of a moist character, particu-

The date of such test, the pressure exerted, and any incidents of importance connected therewith should be matters of record to be referred to at any time. It is generally supposed that a hydraulic pressure approaching the point of the ultimate strength of the boiler is the proper testing strain. Under ordinary conditions it is not the bursting strain of the boiler that is sought to be obtained. A test pressure 33 per cent. in excess of the service pressure, and maintained for some time, will enable the inspector (who should take measurements before, during the pressure, and after) to observe any extensions, distortions or bulging, etc. Should no irregularities be noticed under these conditions, the boiler is safe—if not abused in other directions—for a reasonable length of time, or until the next test is in order. I have personal knowledge of many boilers being ruined by the strain of reckless pressure in testing.

The care and management of a boiler is of as fully great importance as to have it properly designed and constructed. It is at best subject to destroying forces which may reduce its factor of safety from the first day. The principal causes leading to this end are sudden and unequal expansion and contraction of the boiler, as a whole or in part. This evil is created in its worst degree by washing out with cold water while the fire-box or other parts of the boiler are at a high temperature, thus contracting the lower sheets, while those on top are in a high state of expansion, thereby placing the boiler to a stress greater, perhaps, than any ordinary working pressure it may be called upon to bear. Impeded circulation of water within the boiler, caused by accumulated incrustation, or restricted waterways, when these conditions exist in connection with the surfaces exposed to the fire, are influences which rapidly lead to fatigue of the metal. Permitting the entrance of cold air to a fire-box, immediately following the dumping of fire from the grate bars, and the extravagant use of the blower when trying to raise steam hurriedly in a fresh-fired boiler, thus heating and expanding the tubes, result in distortion of tubes and tube sheet brought about by the hasty heating of these parts, while the shell of the boiler is comparatively cool. Low water, when sufficiently low to permit overheating of the plates, results in permanent reduction of their strength.

Early German Studies of American Railroads.*

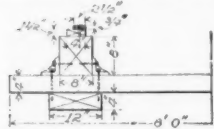
IV.—GERSTNER'S STUDIES IN 1839.

In 1839, when Gerstner visited it, the Syracuse & Utica Railroad, which continued westward the lines hereto-

* See Railroad Gazette.

* Extracts from a paper by Mr. John Hickey, Supt. Motive Power Northern Pacific (late Master Mechanic Milwaukee, Lake Shore & Western), read before the Western Railway Club.

fore described, had been completed only a few months. The line was 53 miles long. The surveys were made as early as 1836, but the panic of 1837 delayed the construction, which was begun in May, 1838; and it is mentioned as evidence of very rapid construction that it was opened July 3, 1839. It, too, was designed as a passenger line. If it carried freight its charter required it to pay the state as much as the tolls on the canal would have been. The superstructure differed from that of the Utica & Schenectady chiefly by heavier longitudinal timbers under the rails, they being 8 in. x 8 in. (instead of 5 in. x 6 in.), and by thinner cross-ties (4 in. thick), which were not mortised to receive the longitudinals, but the two were held together by cast-iron knees (angle irons), with spikes perpendicularly through the bottom of the knees and through the tie into the longitudinal sleeper, and other spikes horizontally through the side of the angle-iron into the upper longitudinal timber. Moreover, the flat iron rail did not rest directly on the



face of the longitudinal timber.

Compared with other flat-rail lines of the country at this time, this might be called a "massive" construction. The most notable feature of the line, however, was that 17 miles of it built through marshes was supported on piles. A difference between the estimated and actual cost of this pile work is recorded, which will doubtless amuse the engineers of to-day. The Syracuse & Utica engineer estimated that the pile sub-structure would cost \$1,500 per mile, calculating that the average cost of the piles, which were to be from 12 in. to 16 in. in diameter and 16 ft. to 24 ft. long, would be 50 cents apiece. Actually, however, the cost was \$3,044 per mile, or, for the 17 miles, \$27,219 for the piles and \$24,522 for setting them. But in spite of this excessively costly part of the line, the whole road had a capital account much below the average, amounting, when it was opened, including rolling stock, to but \$18,219 per mile, against \$22,800 on the Utica & Schenectady. For the six months the road had been opened when Gerstner obtained his information, the average earnings per train mile had been \$3.50, and the travel had been so great that the managers expected to have net earnings per mile as great as those of the Utica & Schenectady, and with their lower cost this would be more than 16 per cent. on their capital. Mr. Oliver H. Lee was chief engineer of this railroad during its construction, and after its opening he superintended its operation, with the title of "general agent," at a salary of \$2,000 a year.

The German visitor makes one observation concerning this road which accounts for a fact in its situation which strikes almost every passenger to-day, and which everybody now deploras. We translate:

The authorities of Syracuse not only did not oppose the building of a station in the middle of the main street (Washington), but they even permitted the company to run their trains through the city with locomotives [trains inside of cities were then usually hauled by horses], which saves considerable time and expense. The company was required to buy land for side streets, and to keep in repair the street on which the railroad was built, and to plant and cultivate trees on each side of it for two miles. As the trains only arrive and depart once or twice a day [italics, translator's], running with the engine through the city causes little inconvenience or danger, while on the other hand the central position of the station is very convenient and advantageous for the company as well as the public. The station, moreover, may be regarded as an ornament to the city.

The Auburn & Syracuse Railroad, which was the next section of the great central line of New York, had had a great deal of trouble in coming into existence, owing to the financial disturbance; and though E. F. Johnson began surveys for it in April, 1835, through trains with locomotives did not begin to run over it till June 1, 1839. But it was so far completed 18 months earlier than, Nov. 1, 1837, trains began running on the road, drawn by horses, strips of oak 3 in. x 1 1/2 in. serving as rails. The proprietors of the stage-coach line between Syracuse and Auburn worked it then. For the through journey, 26 miles, they charged \$1 and paid 45 cents as rent to the railroad company. Two-horses tandem hauled two cars, having seats for 24 each, the 26 miles in 3 1/4 hours. Since locomotives had been used half an hour was the time between the arrival of a train on one road and the departure of the corresponding train on the other railroad at Syracuse, and this half-hour was said "to be necessary for the transfer of the mails."

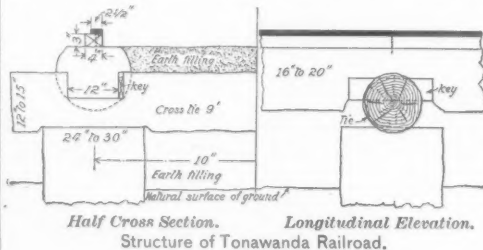
The road was equipped with their locomotives built by Rogers, Ketchum & Grosvenor, of Paterson. The two first delivered had the driving wheels in front of the firebox, and the weight on them was too great and destructive to the road. The other had the drivers behind the firebox and was better suited to the road. They had 10 1/2 x 18 in. cylinders and 4 ft. 8 in. drivers and a four-wheel truck in front, like Baldwin's engines, and weighed empty 21,028 lbs., of which 12,805 lbs. was on the drivers. With water their weight was 1,802 lbs. more, all but 17 lbs. of this on the drivers. They cost \$6,500 each. The cars were mostly like those of the Utica & Schenectady, but special mention is made of one large eight-wheel passenger car, built by Stephenson, in Harlem, on the plan of the lattice bridges, and

called the "lattice car." This car had reversible seats for 60 passengers, and was very elegantly finished. It cost \$2,250 in New York, and \$150 for transportation to Syracuse.

Among officers and salaries on this road we note the superintendent, \$1,200 a year; chief machinist, \$1,000; engineer of road and buildings, \$750; receiver in Auburn, \$500. The enginemen got \$2 a day; firemen and conductors, \$1. Trackmen received 75 cents to \$1 a day, and their overseer \$1.50. The whole force employed in maintaining the 26 miles of track was 20 men.

Beyond Auburn there was a gap in the line between Albany and Buffalo, but of the 78 miles of the Auburn & Rochester Railroad, the next link in it, the substructure was completed for about 25 miles at the close of 1839. This was an ambitious company, which designed to lay 40-lb. rails instead of the flat ones universal between Albany and Auburn, but the time for paying for them had not come yet.

West of Rochester, the Tonawanda Railroad was built earlier than any other line west of Utica. It was chartered as early as 1832, opened for 17 miles in July, 1836, and through to Batavia, 32 miles, in May, 1837. There was a gap of a quarter of a mile in the city of Rochester between its terminus and that of the unfinished Auburn & Rochester. The Tonawanda Railroad had a peculiar structure, invented by its builder, Elisha Johnson. Gerstner compliments him for his invention, and then proceeds to show that it made an abominably bad road. Under each line of rails, 10 ft. from centre to centre measured lengthwise of the road, sections of logs 24 in. to 30 in. diameter, and of lengths varying with the level of the track above the natural surface, were set into the ground far enough to reach a solid foundation. Cross-timbers, 9 ft. long, rested on each pair of opposite blocks. The cross-timbers were logs, 12 in. to 15 in. diameter, dressed flat on the lower surface far enough to give them a bearing on the blocks, and mortised about 6 in. to receive the longitudinal timbers, which were also round logs, squared only where they were set into the cross-timbers and on the upper surface. These longitudinals were 16 in. to 20 in. diameter, made 12 in. square where they sat in the ties, where they were held by



wooden keys on the inside. On the middle of the flat upper surface lay a 3 in. x 4 in. oak scantling, and on this the iron rail, whose section was 2 1/2 in. x 3/4 in. Spikes, 7 in. long, passed through the rail and the scantling into the longitudinal timber. Up to the surface of the latter the space between the blocks and timbers was filled with earth after all the woodwork was completed, which made it possible to haul the earth in cars and dump it where it was wanted.

Experience showed that the blocks, which were the only solid bearings, were too far apart. The longitudinals bent under the weight of the trains; this loosened the spikes, and the ends of the rails came up, tending to throw the cars from the track, so that men had to go over the line constantly to re-drive the spikes. Moreover, it was difficult to keep in line the rails and the scantling on which they rested, and already it had been necessary to renew more than half of the latter.

This road had no passenger station at its Rochester terminus. The cars stood in the middle of the street, where the passengers got in, and were hauled by horses out of town to the engine-house, where the locomotive was attached. It is remarked that at the company's shops a four-horse-power, rotary engine furnished power to run the lathes. There were two freight houses in Rochester, one on the canal in the city and one at the bridge which passes over the canal outside of the city. The latter was considered a very ingenious structure, and the description of its use shows that carrying grain in bulk was already practiced. The station was three stories high, and the tracks ran over the floor of the upper story, while the floor of the second was level with the canal, and that of the lowest story on a level with the street. Freight cars loaded with potash, flour or wheat were hauled into the third story. The barrels of flour or potash (potash was one of the chief exports of western New York in those days) were rolled down to the second floor, from which they could be rolled directly into the canal-boats. Cars of wheat, which was carried in bulk, were hauled over trap doors in the floor of the third story, through which it ran down into bins, whose floor was that of the second story. Every miller who received wheat by rail had his own bin, with his name on the upper trap door. A car consigned to him was set over his bin; the trap on top of the bin was opened, and then a tap in the floor of the car, so that the latter unloaded itself pretty nearly. When the miller wanted his wheat his wagon drove in on the first floor under his bin on the second floor; a trap in the floor of the bin was opened, and the wheat

ran down through a spout into the wagon. This spout had a valve and a padlock, and the miller carried the key. The wheat was usually bought in the country by the miller's agents. Several millers transported their wheat from this embryo elevator to their mills in canal-boats, and the boats were loaded from the bins through spouts, as the wagons were, except that the boats could not go directly under the bins, but lay alongside of them, and so required a longer spout. At the other stations of the Tonawanda Railroad the freight-houses were generally the property of forwarding agents and not of the railroad company. These agents loaded the cars themselves and placed them on the railroad, with which the store-houses were connected by side-tracks.

The freight traffic was much more important on this railroad than on those heretofore described, and while it had six passenger cars it had 46 freight cars. The latter weighed 3,500 lbs., and were able to carry 60 bushels of wheat or 20 barrels of flour. From May 1 to Dec. 1 there were at least two trains each way daily over the road, and usually for a month in the fall, when freight was heaviest, there were three a day. Usually the road was closed for about six weeks in the winter, because the traffic was then insufficient to pay the expenses, and especially the cost of clearing snow from the track. The usual train consisted of two or three passenger cars, one baggage car, and from three to fifteen freight cars. All trains carried both passengers and freight. The average time of making the trip of 32 miles between Rochester and Batavia was 2 to 2 1/2 hours. Fares were about 4 1/2 cents per mile. The freight tariff we will give in full:

	Churchville.	Bergen.	Byron.	Batavia.
Merchandise, per 100 lbs..	10c.	10c.	15c.	18 1/2c.
Flour, bbl.	12 1/2c.	12 1/2c.	16c.	20c.
Wheat, bush.	3 1/4c.	4c.	5c.	6c.
Potash, hams, etc., 100 lbs.	6c.	6c.	8c.	10c.

Churchville was 14 miles, Bergen 17, Byron 25, and Batavia 32 miles from Rochester. It will be noticed that the wheat and flour rates from Batavia to Rochester were just about one-half the ordinary rates in these days from Chicago to New York, which is just thirty times as far. The earnings had been very light, averaging less than \$1,350 per mile per year, 45 per cent. of which was from freight. In 1839, when the whole road was open, the earnings were \$2,356 gross and \$1,476 net, which latter was more than nine per cent. on the reported cost of \$16,000 per mile; but there would be a fearful expenditure for renewals necessary in a few years. The average receipt per train mile was \$1.42, or less than half as much as on the prosperous passenger lines between Schenectady and Syracuse. The average trainload in 1839 was 16 passengers and 8.4 tons of freight, and the average weight of the cars in a train was 27 1/4 tons. A table of the freight carried on the road in 1839 is as follows:

	Eastward.	Westward.
12,583 bbls. flour.		1,584 1/2 tons merchandise.
192,583 bush. wheat.		
659 bbls. (of 500 lbs.) potash.		

All that east-bound freight together weighed about 7,250 tons, and would load 363 modern 20-ton cars. There can be few days in the year now when the daily traffic over this road does not exceed that of the whole year in 1839.

In spite of the bad road, the locomotive repairs on this line had been very light. Down to the close of 1833 two Baldwin engines had done all the work, and during that year they ran about 25,000 miles, with an expense of but \$350 for repairs, 1.4 cents per mile run. Fuel cost 4.3 and oil 1.06 cents per mile run, but we must remember the average load was but 16 passengers and 8.4 tons freight. Gerstner estimates that the freight traffic yielded not more than 20 per cent. of the net earnings, though 45 per cent. of the gross. His estimates of the average earnings and cost of a through trip between Rochester and Batavia are:

	Earnings.	Cost.	Profit.
Passengers and mails..	\$25.47	\$5.20	\$20.27
Freight.....	19.51	15.98	3.53
Total.....	\$44.98	\$21.18	\$23.80

That is, he estimates that only 20.4 per cent. of the passenger earnings were absorbed by the expenses, but as much as 80.7 per cent. of the freight earnings. He did not on that account condemn the freight traffic, however, and was able to see that it alone made the existence of the road possible. "If it had none," says he, "the expenses per mile run would be but little less, and the whole of them would have to be paid by the passengers, making the expense per passenger per mile at least three times as great."

No considerable amount of work seems to have been done then on the line from Batavia to Buffalo, though the map in Gerstner's work shows it as "under construction;" but there was already in operation the Buffalo & Niagara Falls Railroad, between the places named and the Lockport & Niagara Falls Railroad. These were very cheap affairs, both built by John Hopkins as engineer, "who ought to repent," our author says, "having given way to the stockholders, who were not willing to put more money into the enterprise, and built the road so cheaply, and therefore so badly." The Buffalo & Niagara Falls road was completed in the fall of 1836. The structure had 3-in. x 12-in. plank for sleepers, 5-in. x 6-in. cross-ties 9 ft. apart, and white oak longitudinal timbers also 9-in. x 6-in., carrying the 2-in. x 1/2-in. flat rail. This structure was evidently too weak, but

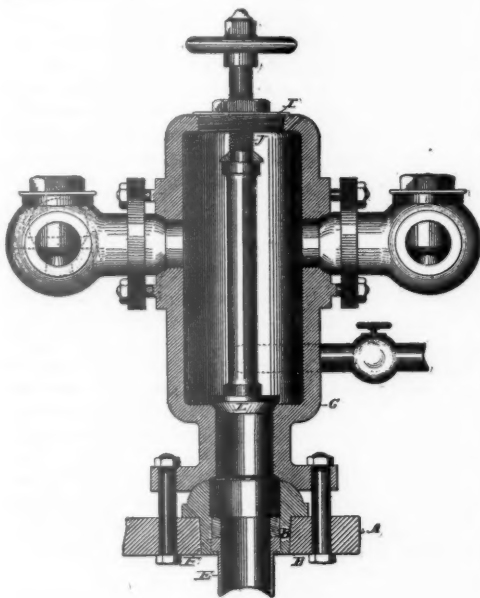
the company could not afford to change it. The company had three locomotives, but only one was used at a time. It ran till it needed new repairs, when another took its place. One of its locomotives, made in Lowell, was originally a four-wheeled engine, but it worked badly, and a four-wheel truck was put in the place of the front pair of wheels. Then, as the weight on the drivers (which were in front of the firebox) was too great for the road, a pair of small wheels was put behind the firebox, and so arranged that by means of a screw the engineman could bring more or less weight upon the drivers. A locomotive made in New York was tested in the same way; but the third, a Baldwin engine, which had its driving-wheels behind the firebox, worked satisfactorily without change. This road cost \$7,347 per mile.

The Lockport & Niagara Falls line, 46½ miles long, was completed May 1, 1887. It was lightly and poorly built, and was already in pretty bad order, though perhaps as good as could be expected of a road which had cost only \$8,083 per mile; but even this was \$20,000 more than the capital paid in. The excess was a debt which at that time was absorbing the net earnings, which during the two years and seven months it had been open amounted only to \$249 per mile, or 3 per cent. on its cost. A branch of this road three and one-third miles long extended to Lewiston, where it received passengers for Niagara Falls coming from the Lake Ontario steamers.

With this account of the railroads which afterward were united in the New York Central, we must close for the present our gleanings from Gerstner's book, which contains similar material concerning the New England, New Jersey, Pennsylvania, the southern and the new western railroads of 1839.

Phillips's Check Chamber.

This device is rather a novelty, and is intended to provide a cut-off between check valves and boilers in such a way that the checks can be removed from the action of mud, and can be repaired without lowering steam. It is also intended to prevent water from leaking out of the boiler or freezing in the pipes. Its main object then is to render the boiler check a reliable device. It is being used by the Richmond & Danville, Georgia Pacific, Charlotte, Columbia & Augusta Railroad and others. It is manufactured by W. B. Alexander, Birmingham, Ala.

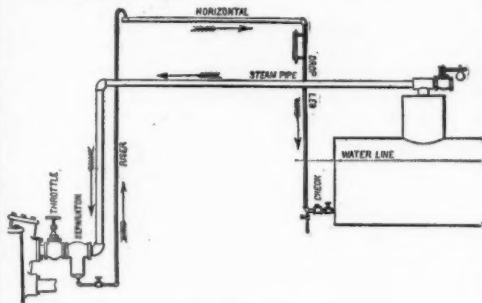


Phillips's Check Chamber.

The strength of this device is shown by the accompanying cut, in which A is a section of the boiler in which is screwed a threaded bushing B provided with a flange, upon which is carried by means of the shoulder the interior check pipe E. F is a threaded ring which is screwed into the bushing B to hold the interior check pipe in place. The chamber G is held to the boiler by bolts and a joint is made on the ring B. Into the top of the chamber is screwed the threaded cap I, through which passes the threaded stem J, at the lower end of which is the valve L, and at the upper end a conical packing, as shown. This packing forms a tight joint with the cap to the chamber when the stem is screwed up. On the sides of the chamber are secured pipes which communicate with the injector through the checks, as shown. The operation is as follows: The stem J is screwed up, and the passage from the boiler to the chamber is open. The injectors, now being set to work, discharge water in the chamber G, from which the water runs by gravity into the boiler. The check valves are thus entirely out of reach of water in the boiler, and if the injector becomes disabled or the check valves refuse to operate, the check J is screwed down until the valve L shuts the chamber from the boiler, when all the parts may be cleaned. Those who have been using this device speak well of its performance.

A Steam Loop for Return of Condensation.

A recent novelty of steam engineering is shown by the accompanying illustration, of what has been termed by Westinghouse, Church, Kerr & Company, a "steam loop." It consists of a pipe rising from any point in a steam system where condensation collects to a horizontal pipe above the steam system which extends to a point above the boilers. From this there is a vertical pipe reaching to a check valve at the bottom of the boiler. Where the first vertical pipe or "riser," as it is termed, joins the horizontal pipe, there is a vertical half turn, as shown by the cut, arranged in such a way that the riser pipe enters the top of the horizontal pipe. The pipe reaching from the horizontal pipe to the boiler vertically is called a "drop leg." The illustration shows the steam loop applied to return water from a separator in a steam pipe to a boiler.



A Steam Loop.

All are familiar with the loss by condensation in the transmission of steam, and with the saving which may be had if this condensation is returned to the boiler. The causes of loss are about as follows: Direct loss of hot water wasted in drainage; direct loss of heat in condensation; loss by reduction of steam pressure; loss by reduction of efficiency when steam is used expansively, and loss of the purifying power of the distilled water which would assist in preventing formation of the boiler scale if returned to the boiler.

We quote what follows from the description by the makers:

It looks like a paradox. What makes it work? Out of the many forms of explanation which we have used, the following is the least open to the charge of scientific theorizing: Take a pair of scales and put 10 ozs. in one pan and 9 ozs. in the other; then lift the scales, and what will happen? Both weights will rise, but the 9-oz. weight will rise the quickest and the highest. The steam loop is a pair of scales in which the lifting force is the slight tendency toward vacuum which arises from condensation in the "horizontal," and acting on both the "riser" and the "drop-leg." The water in the "drop-leg," being the solid water of the boiler, will be raised only a short distance (sufficient to balance the difference of pressure), while the water in the "riser," being in the form of a light spray or film, will be lifted quickly to its full height and poured into the "horizontal," whence it simply runs down-hill into the boiler. This action is further aided by the friction arising from the sweep of the steam current toward the "dead-end." In fact, the steam loop is an artificial "dead-end," in which, as is well known, water will rapidly accumulate, but with this difference, that as fast as it falls on the top of the water column in the "drop-leg" it discharges from the bottom into the boiler.

Is this method of returning water economical? You can answer this practically for yourself by considering that there are no moving parts to absorb power in friction, or to create expense in repairs; and, above all, that it is a closed system, exhausting not into the air, but back into the boiler. Remember, also, that the "riser" and "drop-leg" are always covered with non-conducting material, and the "horizontal" may be partially or wholly covered according to local circumstances. If a plain pipe, well covered and exhausting into the boiler, will perform the work of returning condensation, it is evident that no mechanical device can compete with it in economy.

Indian Railroad Notes.

II.

The introduction of bogie frames has again been urged. Strange to say, they have scarcely been tried yet, and the broad-gauge lines are still running carriages and wagons with a rigid wheel base of 15 or 16 feet. Freight wagons such as you have recently described are badly wanted in India, both for the sake of economy and also to reduce friction on the sharp curves which are now being laid where land is valuable or the alignment difficult. Wood, however, would not find favor, even for the floors. The types most in favor now have sheet-iron sides and bottoms, strengthened with angle or T iron, and roofs of corrugated iron. The frame, and in fact every part, is made of iron or steel.

Your type of passenger carriage does not find favor in India, the objection being that they lack privacy. When traveling long journeys, both first- and second-class passengers undress at night, and, as all travelers carry a supply of bedding with them, a fairly comfortable bed can be made up on the seats, which have no dividing arms. There are no sleeping-car porters, and no extra charge is made for sleeping accommodation, but it is not guaranteed, and, when the traffic is heavy, travelers often have to sit up all night. Separate compartments are also required for ladies who are traveling alone, but this could be met by reserving one end of a Pullman car for them on all through trains. As gentlemen always wear a sleeping-suit (loose coat and drawers) at night, and ladies invariably wear dressing-gowns at night, it would

not be so very dreadful were a gentleman picked up during the night at some roadside station to enter a carriage occupied by ladies, or vice-versa; still the feeling exists, and, when carriages with end doors and a passage down the centre were tried, no one would use them except under compulsion.

Dining-cars would also be an immense improvement and save the long stoppages of from 20 to 40 minutes at refreshment-room stations, to say nothing of the convenience. Still, the proposal to introduce them has not been favorably received, although every endeavor is being made to economize time in order that mails and passengers may be carried as quickly as possible between inland parts of India and the seaports, as well as the different sanitariums in the Himalayas.

As a setoff against the low ratio of working expenses on the Madras and East Indian railways, it may be mentioned that the working expenses of the Indian Midland Railway amounted to 76.13 per cent. of the earnings last year. This was due to the very small amount of traffic obtained; and although the promoters of this line are still sanguine, it is feared that their expectations will never be realized.

Projects for any number of feeder railroads are now being brought forward, and this is no doubt a move in the right direction. During the rainy season (June to September inclusive) the roads in many parts of the country are impassable, and, while the railroads are suffering for want of traffic, cultivators are losing the sale of their produce. Tramways with a gauge of 2 ft. 3 in. are also advocated, but this will entail extra labor and loss of time at every junction.

Mr. D. W. Campbell, C. I. E., Agent of the E. I. Railway, leaves India for good in April next. For more than a quarter of a century he was Locomotive Superintendent of the same line, and when Sir Bradford Leslie retired, in 1887, Mr. Campbell was chosen to succeed him as the chief officer of the company in India. He is still a strong, active man, and will probably continue to do good service to the company as one of the Home Board of Directors. A better selection could not be made. The post which he vacates has, it is said, been offered to no less than four officers of the Royal Engineers in succession, but none of them has accepted it, although the salary is 3,500 rupees per month. The new chief engineer, Mr. F. E. Robertson, who has already done yeoman's service in reducing the expenditure in his own and other departments, is now first favorite for the post, and will probably perform the dual duties of agent and chief engineer from the date of Mr. Campbell's retirement.

For some time past the Punjab has been troubled with immense flights of locusts, which have not only damaged the crops, but have also interfered with the running of trains. The metals are a favorite resting-place for these pests, and, as they do not attempt to fly away when a train approaches, the rails soon become so greasy from the quantity that are crushed that the drivers commence to slip, and no amount of sand will make them grip. The mail train lately lost nearly an hour from this cause, and in several cases heavily loaded goods trains have been brought to a stand, and could not be moved again until the rails were cleared of the locusts. This may appear strange, but it is perfectly true.

CALCUTTA, Jan. 26, 1891.

Lubrication of Steam Chest Valves and Engine Trucks.

At the March meeting of the Northwest Railroad Club there was some discussion on the above subject. Mr. W. H. Whittaker, of the Minneapolis & St. Louis, was of the opinion that it mattered little what quality of valve oil was furnished. The chief cause of poor results is the lack of care on the part of the men. It pays to furnish the best oil, but it must be prudently used. Mr. William Mackintosh, of the Chicago & Northwestern, read a paper as part of the same discussion. He dwelt particularly upon the importance of good lubrication for engine trucks. Among other things he said: "When the box is new and the brass full size, fairly good lubrication is obtained from the packing. But as the brass wears, the box drops and carries the cellar with it until there is nearly an inch of space between the journal and cellar. The cellar-bolts also wear the holes in the lugs of box oblong, which is not surprising considering that the cellars weigh from 15 to 20 lbs., with packing. I have tried various ways to overcome this trouble, and I have finally developed a plan to support the cellar on spring-seated yokes arranged for required adjustment. This dispenses with the heavy cast-iron cellar and permits the use of one made of light sheet-iron (or preferably pressed steel) weighing less than 5 lbs., with packing. The cellars can be applied to the ordinary engine truck box at little expense, and when once in place are securely locked and will last indefinitely. I am also using a simple device for conveying oil from a cup conveniently located on engine frame, through a flexible tube direct to the journal, instead of depositing it on the waste on top of the box. An engine thus equipped may be run continuously without other care than an occasional filling of the cups, and with absolute freedom from heating, and effect a saving of at least 75 per cent. in oil.

"On the divisions with which I am connected, the average mileage for all kinds of fuel for the year ending Jan. 31, 1891, was slightly in excess of 24 miles to one pint. Twelve years ago our engines were making but six and seven miles to a pint. And it has not been brought about by any one particular influence, but rather by a combination of conditions, such as larger bearings, better quality of oils, closer attention from foreman and those in charge of supplies, and the hearty co-operation of the engineman, without which the best oils and appliances are of little avail. I do not believe in limiting the supply of oil furnished, preferring to leave that matter to be governed by circumstances and the judgment of the engineer, but with the understanding that every bearing is to receive proper lubrication."

"Nutmeg" need not fear that American readers will doubt this story. The same thing has repeatedly happened in Kansas and other western states in "grasshopper years."—EDITOR.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

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President Depew, of the New York Central, in the voluminous "copy" which he furnished for the reporters during the week following the tunnel collision, told them, in connection with his essay on the duties and responsibilities of directors, that such officers could not consider and decide upon questions belonging to the operating department; that those must be left to men intimately acquainted with the details of the subject. And yet, this week he comes out with the statement that he has given orders for trains to comply with the ridiculous recommendation of the Railroad Commissioners, that trains be run through the tunnel at only 15 miles an hour. We cannot imagine that Mr. Depew has any subordinate officer who would for a moment think of enforcing such an order, and we must therefore conclude that he has changed his mind and does take an interest in operating questions. Every train coming into the Grand Central Station must now be at least five minutes late, the normal running time through the tunnel being about three minutes, and the time occupied under the 15-mile-an-hour rule eight minutes. It is true that there have been numerous delays to morning and evening trains all along before, owing to the overcrowded yard and other reasons; and the passengers' time wasted, which the commuters will at once loudly complain about, will not seem such a serious injury as it would if the complainants had always heretofore made their connections promptly. But when the stifling weather of midsummer comes on, both passengers and officers will doubtless wish that the suggestion to make one block of the whole tunnel had been agreed to, as that method (unscientific as it is) would be a lesser evil. Perhaps the system of signaling will have been "improved [by the addition of torpedo attachments] so as to meet the approval of the commissioners" before that time arrives, but one can hardly take a hopeful view on that point, for the company has already stationed a man with torpedoes at every signal, and if the commissioners are not satisfied with that it is a question whether they would be satisfied with anything. Evidently, both the commissioners and Mr. Depew have become somewhat "rattled." The recommendation that electric illumination be tried is as silly as that about the speed, but as the experiment will probably be wholly harmless, no one but the stockholders need object. All the suggestions about lighting the tunnel have come from people who do not realize the radical difference between the space interval and the time interval systems of running trains. They have not got over the idea that, in addition to a block system, we must have tail lights to depend upon; and they demand illumination because Engineer Fowler said that he did not see the tail lights of the empty car train. But the block system, if it is worthy of the name, is reliable for trains which exhibit no light whatever to following trains.

The full text of the Railroad Commissioners' report on the collision reveals some points not given in the telegraphic summary. The severely technical and scientific habit of the man who writes these reports,

which has been noted in previous utterances of the Board, is shown here in the statement that "the signal consists of a lamp on a pole." The commissioners say that the gong signal "was clearly defective," in that the hammer would not sound when a train passed at high speed, and that fireman Wellington is not color blind. The New Haven road had a few days previous to the accident expressed an intention to conform to the New York heating law, "inasmuch as steam heating had been greatly improved, admitting of the use of hot water instead of direct steam." The report forcibly summarizes the answers to those weak-kneed people who fear more danger from continuous heating systems than from individual heaters. It is not stated that the auxiliary torpedo apparatus has been reinstated, but that "the companies have concluded to equip each home signal" with it. "Improvements are claimed to have been made which justify a retrial." The formal conclusion of the Board is that the engineer and fireman passed the signals at danger "from failure to see them in consequence of fog, steam and smoke." Inasmuch as the fireman passed within about 5 ft. of these signals, and the engineer within probably 10 ft., most railroad men will wonder where the sense of the quoted phrase comes in. The reason why these men ran by the signals is held by most good judges to be something quite different from this. The commissioners recommend an audible signal at the home signal, and apparently agree with those who object to giving an audible warning at the caution signal; but they do not tell us how this plan will work when a train stops only a short distance beyond the home signal, and is followed by a runner who forgets to shut off steam till the audible signal warns him. It would then be necessary to resort to the Patent Office for one of the many devices that have been invented for stopping heavy trains instantaneously.

The Commissioners ought to have investigated the divided responsibility in the management of trains running through the tunnel. Ostensibly the "Harlem line" is under a joint and impartial government, the manager of the Grand Central Station being the agent of the associated roads; but as the New York Central has the two votes which its constituent companies controlled before the lease of the New York & Harlem, while the New Haven has only one, the Central really controls the situation, and various incidents that have come out since the collision give evidence of the friction, of a more or less mild character, existing between the two companies. It is said that Engineer Fowler has been reinstated, a proceeding which, it can safely be assumed, the New York Central would not have agreed to, though this is not the first time we have heard of a road justifying an engineman in a controversy in which another road was concerned, where all precedent indicated that the same conduct on his own road would have resulted in the engineman's condemnation. The signalmen being controlled by the Central, the familiar controversies which arise whenever there is a question of discipline involving conflicting claims of train and station men are liable to come up here at any time, and there should be a well-defined system for administering equal treatment to both sides.

The Time Convention.

Spring has come. A number of superintendents have errands in New York "about—this—time," as the old weather predictions used to say. The theatres blossom out with their post-Lent attractions, superintendents' wives are ready to do their metropolitan shopping; and, finally, there must, in a month or two, be fewer trains on Southern roads and more on Northern, and so railroad men come to New York to hold a time convention. Those who must agree with connections about schedules do it before or after the meeting, with about as much regard to the decision of the Convention as to the phases of the moon, or probably less; and they and all the rest may, in fact, forget what that decision is, without appreciable public injury.

But it hardly needs this introduction to make clear to most interested readers that the Time Convention has outlived its usefulness as a time convention, that its good work done during the last eight years has been entirely distinct from its original mission, and that the organization must in the future do something besides fix dates for time tables if it is to justify itself as an organization. The last few meetings have been comparatively profitless and there is something in the nature of a crisis approaching. Shall this body go on doing valuable work for the roads which support it, or shall it be allowed to dry up and become a mere shell?

The Time Convention has done valuable work. It established our present system of standard time, which,

like many other reforms, is so valuable and fits into our daily life so nicely that the importance of the achievement is not realized. The adoption of the standard code of train rules had the effect of consigning to oblivion a great mass of bad or imperfect rules, and greatly promoted the efficiency and safety of operation. The investigation of car service practices, although it has not yet been productive of important results, was nevertheless a work that was needed, and whose value will yet be apparent. But standard time was settled long ago. Car service has run against a big snag in the fact that it is so intimately connected with the operations of the traffic department that the superintendents cannot manage it alone. The parts of the train rule discussion which have thus far been settled may be called the easy questions of the problem, and those which are still susceptible of profitable discussion may be called the hard ones. The last few meetings of the Convention have been dull because of this growing difficulty connected with all the important questions. In fact most of the work remaining to be done by the Convention is more difficult than the tasks which have heretofore engaged it, and united and vigorous effort must be put forth if the good work is to be continued. It cannot be effectively carried on by a few energetic workers. In most deliberative bodies it is often true that a few strong men can do great things, for enthusiastic leaders will enlist a following, but railroad managers are the last men in the world to follow any one. They are so accustomed to leading that their independent spirit sticks to them in the Convention, and any course of action must commend itself to them very fully before they will accept it.

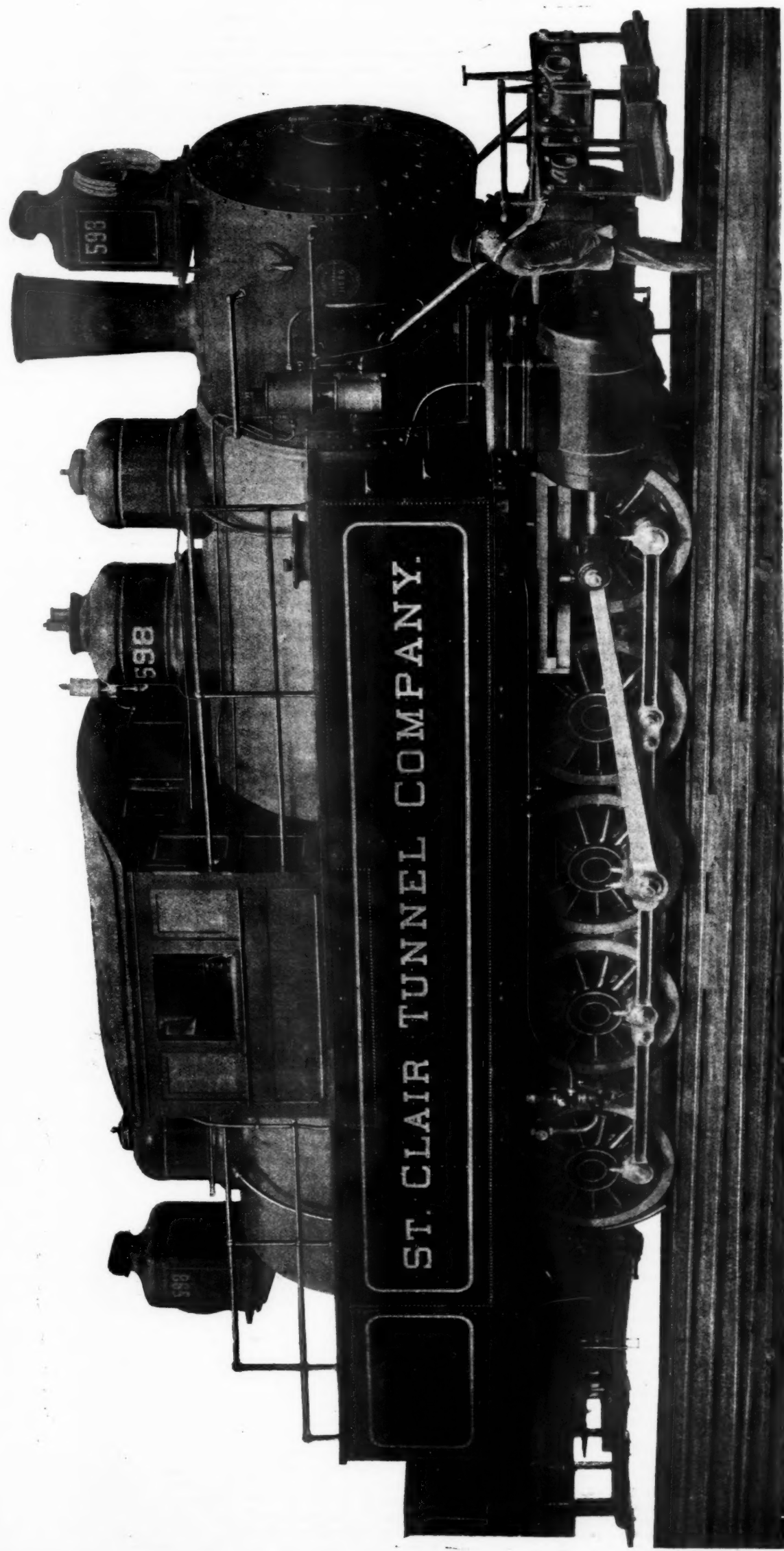
The true mission of the Time Convention was clearly set forth in the address of Colonel Haines, the President, at the meeting a year ago. His most practical suggestion was that concerning the management of employes. This is a broad subject in itself, and one that admits of several subdivisions. If we add to it the subject of signaling, which is at least half a matter of discipline, and which has not been taken up at all by any lower association,* we already have a useful and adequate line of work for the Time Convention, for a while at least. Such subjects as that mentioned in contributions by general managers in the *Railroad Gazette* of Feb. 13 and 20 last, and discussed editorially in a subsequent issue, may well engage the attention of every member of the Time Convention. The shifting policies adopted by a number of roads in dealing with striking or complaining employes constitute a reproach to the railroad profession, and demand discussion with a view to enlightening more than one grade of officers.

Since writing this article we have received a letter from a well-known member of the Time Convention, and it is printed in another column. He apparently tempers his exhortation somewhat, in deference to the view that busy managers cannot invent new schemes; but if he had followed out his last paragraph more minutely, he would no doubt have said, what is apparent to all, that matters affecting the personnel, to which we have just alluded, must be settled by these same busy men. If the acting managing officer does not grapple with them they will drift, no one knows where. Master car-builders and inventors will not take this burden off the superintendents' shoulders. And will the members of the Time Convention say, individually, that they want no aid or counsel from their brethren on these subjects?

There are those among the members of the Time Convention who think that its usefulness is impaired by the secrecy of its proceedings, and others who, like our correspondent "Sic Transit," think that the discussions are perfunctory and fruitless. We can see no advantage in secrecy, and the questions which come up can seldom require it. But if the nature of the Time Convention is to be changed from that of a confidential conference to that of a deliberative body, it must be managed as other societies have been managed under similar circumstances. Committees are needed, not simply to do work themselves but to get work out of the membership generally. A committee, to promote intelligent discussion, must get papers prepared beforehand and send them around to the members in advance of the meetings, so that they may be discussed to some effect. The meeting next week should appoint a committee (or instruct an existing committee) to take definite action in this direction before the fall meeting. To simply as emble and hear a report from the Safety Appliances Committee will be a failure to fulfill the real mission of the convention.

If, indeed, the General Time Convention is too large

*The Superintendents' Society has now a standing committee on signaling, but the committee has not yet reported.



DECAPOD TANK FREIGHT LOCOMOTIVE FOR WORKING THE ST. CLAIR TUNNEL.

Built by the BALDWIN LOCOMOTIVE WORKS, Philadelphia, Pa.

(For description see page 228.)

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a body or too unwieldy to take up and usefully discuss the subjects we have referred to, or if the majority of the members composing it feel that they have not the time to give to such matters, then it is the duty of all to encourage the Superintendents' Association, or to promote some sort of an organization to do this neglected work. Quite likely the general managers, general superintendents, general passenger agents and division superintendents composing the convention ought to be separated into different bodies. The members might well think of this, and confer about it, for it is a waste of their employers' time and money to come together for a mere good time or desultory talk, when definite and important results might just as well be achieved.

Influential men in the convention complain that members do not take pains to interest directors, presidents and stockholders in this really important work of their servants. We scarcely need add that this is a duty which the *Railroad Gazette* has often urged upon operating officers. It is a libel upon directors to say that they can take no intelligent interest in details of railroad operation, President Depew to the contrary notwithstanding. Every working officer knows that they do take a very decided interest in questions which they understand. If a director whose forte is finance finds a new method of saving money he very quickly puts it in practice, even if he got it a thousand miles away. Instances of presidents becoming convinced of the value of patent lubricants, signals, machines, etc., and ordering them used, are familiar to all. What can be plainer than that their interest should be enlisted in all meritorious innovations or improvements and what plainer than that superintendents should do this enlisting? There need be no fear but the "crank" inventors will see that their schemes are brought to the attention of the very highest officer on your road; but if the really hard problems that fall to your lot, those on which you ought to get help by discussing with your brethren in the Time Convention, are to be fully appreciated by your president you must present them yourself. Try to tell him in detail why you wish to attend the Time Convention, and you will then have a livelier notion of the reasons in your own mind; if this does not prove to be the case then ask yourself whether you really ought not to stay at home and let him send some other officer.

Recent and Contemplated Changes in Locomotives for Elevated Roads.

Since the opening of the elevated roads in New York City the engines have been increasing in weight. The new class, "K," with 12 x 16 inch cylinders weighs 47,000 lbs. total, with 31,500 on drivers and 15,500 on the truck. The new motors for the Suburban Rapid Transit weigh 55,000 lbs., with 41,000 lbs. on the drivers, and 7,000 on each leading and trailing truck. The new engines for the Kings County will weigh 58,000 lbs., with 41,000 lbs. on the drivers. The early, four-wheel, tank engines used for a long time, some of which are still running, weighed but 30,000 lbs., of which 19,000 was on the drivers.

From 19,000 lbs. to 41,000 lbs. on drivers is a large increase in capacity. This has been made necessary by the increase to five-car trains in the place of three, by the increase in the weight of the cars, and more particularly by the increased average speed over the lines. Down town on the Sixth avenue line several new stations have been added, requiring more stops per mile. The average number of stops per mile from the Battery to 155th street is two and one-half. The average speed over the line is in some cases 13½ miles per hour. To do this with five, 14½-ton cars with a good load of passengers in each, is no small task for such engines as are permissible. It would of course be easy if there were no stops to be made or if one-half of them were cut out.

Five loaded cars weigh about 100 tons; add to this the 24 tons of engine, and the trainload is 124 tons; to accelerate which, at the rate necessary to make time between stations is all the present engines can do when worked to their utmost capacity. One might reasonably suggest the use of lighter cars, but there are two strong objections to be overcome which have so far baffled all attempts to reduce the trainload.

The first objection to lighter cars is that the present ones, at 14½ tons each, are none too strong and durable to withstand the loads and service which they receive; and to keep the car repairs within reasonable limits many details have been increased in strength, and therefore in weight, until the present total of weight is reached. These cars carry about six tons of passengers, and it is believed that a 14½-ton car is as light as is consistent with safety. A Pullman for one-quarter of that number of passengers weighs three times as much,

and the ordinary day coach carrying a smaller number of passengers, which often goes to pieces in a collision, weighs twice as much.

The second reason for not decreasing the weight is the decrease in braking power, which must necessarily attend a decrease in the dead weight of car. The braking power is usually 90 per cent. of the dead weight. This power is sufficient to stop an empty car moving at 30 miles per hour in a distance of 400 ft.; but when the car is loaded with six tons of passengers such a stop cannot be made with the power then available, as the braking force in proportion to the load is decreased. If the braking power were made for a loaded car, the wheels would be slid under the same car when empty. It is just as important to stop quickly as it is to start quickly; hence a liberal braking power is essential to fast speed in service of this class.

Until some satisfactory design of metal car is brought out that is stronger and lighter than the present wooden ones, and until some means are used for varying the braking power on such individual cars directly with the load, there will be no decrease in train weight with five cars on elevated roads; and therefore there will be no decrease in the weight on drivers of motors for such roads.

Of course if some means were devised for increasing the adhesion of the drivers without increasing the weight on them, faster time could be made, and heavier trains hauled with motors of the weights now used; but that takes us into the region of pure speculation. The Manhattan company is now having the Swinerton polygonal tires fitted to a locomotive at the Baldwin works. We suppose that no one but the owners of the patents take this experiment seriously. Aside from that, there seem to be no experiments going on in traction-increasing devices.

The present form of locomotive on the elevated roads is a result of a succession of changes from the early light Forney engines first put into service. While a very efficient machine has been developed, there has been no complete and general improvement of the design because of the limitation of weight, and the engines still have many parts too light or too small in the wearing surfaces for the present demands. The frames are so light that breaks are common and repairs are expensive. New locomotives are building with steel frames made from one slab. These are of the same dimensions as the old frames, but, being all in one piece without welds, it is hoped that they will stand better than the welded ones of wrought iron. However, it will be difficult to repair them in case they do break, as a weld in steel is not reliable, and there is not sufficient material in the frames to make a splice or a patch feasible. This goes to show how all increase of weight is avoided in seeking for sufficient strength and durability. New elevated engines have also wrought-iron driving wheels, made at the Baldwin works under the Vauclain patents. Soon, throughout the engine, there is need for greater strength and larger wearing surfaces to reduce the cost of repairs. On the Kings County road where somewhat greater weight is permissible, and also on the Chicago & South Side Elevated, in Chicago, there will be heavier engines and decided changes in design. The frames will be of wrought iron of increased dimensions; the link motion will have larger wearing surfaces, and the cylinders will be increased from 12 x 16 to 13 or 14 x 16. The boilers will have more heating surface and larger steam space. Some at least of the new equipment will be compound, but the majority will be single-acting until the value of compounding is assured.

So far as the locomotive design is concerned, there is no railroading which presents more exacting conditions than are found on the elevated railroads. The speed from terminus to terminus must be considerable, and with the very frequent stops it must be high between stations. Yet the weight on drivers must be kept down to a minimum. These conditions have been very skillfully met on the elevated roads of New York, but they are daily becoming more severe as the service grows; and we may reasonably look for important modifications in the future.

The Canadian Pacific and the New York Central.

A good deal of public attention has been given in the last few days to a traffic arrangement between the New York Central and the Canadian Pacific. In fact the arrangement has probably had from the press more attention than it deserves. It is still incomplete, and therefore we cannot say just what it amounts to. So far it is a simple traffic agreement by which the Canadian Pacific business formerly going over the Rome, Watertown & Ogdensburg and the New York, Ontario & Western is to be billed over the West Shore.

It may be a slightly better arrangement for the

Canadian Pacific than the old one, and, of course, it transfers some business from the Ontario & Western to the Central, but the great advantages to any one that are to flow from it are yet quite speculative. It brings no new business to New York, and transfers very little from one road to the other. It would surprise a good many people to know just how little this business has been heretofore. Why the traffic coming to New York from the Canadian Pacific is naturally not great is apparent enough. That road now delivers freight at deep water at Montreal, Halifax, Portland and Boston, and by all those lines it gets a longer haul than on freight sent over the New York Central lines from Ogdensburg. At Montreal it delivers freight to transatlantic steamers in which it has a proprietary interest. So from the standpoint of that road its only object in getting a New York connection is to haul freight that must go to or from New York.

This may eventually be considerable, and probably will at once increase somewhat over what it has been, from the fact that the Central and West Shore will be able to offer better time and facilities than the former New York connections of the C. P. have given. Of course this road wants the best New York connection that it can get, but it is not likely that it will sacrifice any of its other great and established interests for the sake of that connection. Its business has mostly gone to Montreal and Eastern ports; little if it has come to New York. Probably that will continue to be the case. Most of its New York business is Canadian local traffic and traffic to and from St. Paul and Minneapolis. But that is a business that the New York Central cannot afford to foster at the expense of the Vanderbilt lines to Chicago and the Northwest. We are told that the Central will not discriminate between these different routes; but it is not reasonable to suppose that it will favor the Canadian Pacific.

It has been suggested that the Canadian Pacific will be able to offer a low through rate by cutting its own share. This is a possibility, of course, but we doubt if any more of this will be done in the future than has been done in the past. It must be remembered that the Canadian roads are not the worst rate disturbers. They are quite as law abiding as many roads on this side of the border.

To sum up: The immediate loss to the New York, Ontario & Western and gain to the New York Central is insignificant. The ultimate development is purely speculative, but is not likely to be very important to either road concerned. If the agreement keeps the Canadian Pacific from building a parallel line to some New York connection the public and all the railroads in interest may congratulate themselves that one waste has been prevented.

The Monon Situation.

The general balance sheet of the Louisville, New Albany & Chicago on Dec. 31, 1890, showed bills payable and audited vouchers for about \$2,000,000. This floating debt was carried at the cost of great annoyance and large expense for interest, and threatened to throw the company into a receiver's hands. In the company's treasury were \$2,800,000 of general mortgage bonds. A syndicate was formed, composed in part of firms whose representatives are in the new board of directors, to relieve the road's pressing wants. After a careful examination into the physical, commercial, and financial conditions of the company, an agreement was signed, the syndicate undertaking to meet the obligations of the railroad company as they mature, and to take the bonds now in the treasury in payment.

All the old directors resigned (though five were re-elected), and a new board was elected under a resolution abolishing the classification, so that hereafter the entire board is responsible to the stockholders at each annual election. The names of the new directors are given in our news columns. They include representatives of the houses which will advance the money to relieve the road. The new board commands public confidence in its financial strength and is prepared to guarantee all creditors of the road. The new management announces that there is no change in policy, but that the property will be operated solely in the interest of its proprietors, and as an independent road maintaining the same friendly relations with all connections as in the past.

During 1890 about a million dollars was spent for betterments, equipment, rails, bridges, and the like, so that the road is now in fair condition, requiring but little more to be done. The new owners are largely interested in the East Tennessee system, and the Lake Erie & Western. The Louisville Southern (connecting the New Albany with the Cincinnati, New Orleans & Texas Pacific, now a part of the East Tennessee) will become a factor in carrying the Chicago traffic to and from the East Tennessee system, via Louisville and the New Albany road, which now goes through Cincinnati. The Lake Erie & Western, whose western terminus is Peoria, will now have a Chicago line for its eastern traffic, and,

though a roundabout route for Chicago, the increase to both roads will be something.

The Louisville, New Albany & Chicago runs through the section of Indiana where brownstone is found, a traffic capable of much expansion and paying a cent per ton per mile. A road is being built from the Brazil coal fields to the New Albany main line, and a future large traffic in soft coal can be secured when desired. Altogether the new managers think that under careful superintendency the old traffic of the road can be stimulated and new business gathered from the connections now controlled by the same parties, so that the Monon's earnings, both gross and net, will be increased, and the property put on a firm basis of credit.

The rate per ton per mile in 1890 was .882 cent; the average train load 176 tons; the proportion of empty freight car mileage to total was 31 per cent. Bituminous coal comprised 12 per cent. of the tonnage carried, stone 23 per cent., lumber 15 per cent. and grain 6 per cent.; total tons carried 1,323,423. The average passenger fare was 2.2 cents; number per train, 26. The road ran fast trains between Chicago and Cincinnati, via Indianapolis and the C. H. & D., and also trains to Louisville. Maintenance of way cost \$520 per mile owned. The road owns one-fifth of the Chicago & Western Indiana, whose terminals it uses to reach the city of Chicago. The property of this terminal road is considered very valuable by the companies owning and using it.

February Accidents.

Our record of train accidents in February, given in this number, includes 93 collisions, 93 derailments and 10 other accidents, a total of 196 accidents, in which 61 persons were killed and 275 injured. The detailed list printed on another page contains accounts of only the more important of these accidents. All which cause no deaths, or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS:	
Rear.....	47
Butting.....	25
Crossing and miscellaneous.....	21
DERAILMENTS:	
Broken rail.....	5
Loose or spread rail.....	6
Broken bridge.....	3
Defective switch.....	2
Defective joint.....	1
Broken wheel.....	1
Broken axle.....	1
Broken truck.....	2
Fallen brakebeam.....	2
Broken car.....	4
Loose tire.....	1
Broken side rod.....	1
OTHER ACCIDENTS:	
Boiler explosions.....	3
Cylinder explosions.....	1
Various breakages of rolling stock.....	3
Other causes.....	3
Total number of accidents.....	
196	

The causes of collisions, where given, were as follows:

	Rear.	But- ting.	Crossing and other.	Totl.
Trains breaking in two.....	4	2	1	7
Misplaced switch.....	2	3	2	7
Failure to give or observe signal.....	3	—	—	3
Mistake in giving or understand- ing orders.....	—	5	—	5
Miscellaneous.....	17	3	12	32
Unexplained.....	21	14	6	41
Total.....	47	25	21	93

A general classification shows:

	Col- lisions.	Derail- ments.	Other Accidents.	Total.	P.c.
Defects of road.....	17	—	—	17	9
Defects of equipment.....	5	13	7	25	13
Negligence in operating.....	47	5	—	52	26
Unforeseen obstructions.....	—	15	3	18	9
Unexplained.....	41	43	—	84	43
Total.....	93	93	10	196	100

The number of trains involved is as follows:

	Collisions.	Derail- ments.	Other Accidents.	Total.
Passenger.....	47	32	6	85
Freight and other.....	127	61	4	192
Total.....	174	93	10	277

The casualties may be divided as follows:

	Col- lisions.	Derail- ments.	Other Accidents.	Total.
KILLED.				
Employees.....	33	18	1	52
Passengers.....	—	6	1	7
Others.....	2	—	—	2
Total.....	35	24	2	61
INJURED.				
Employees.....	102	57	2	161
Passengers.....	21	84	3	108
Others.....	5	1	—	6
Total.....	128	142	5	275

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road.....	1	21	—	21
Defects of equipment.....	—	26	6	8
Negligence in operating.....	—	21	35	105
Unforeseen obstructions and maliciousness.....	1	3	4	11
Unexplained.....	5	57	—	16
Total.....	7	108	45	141

Thirty-seven accidents caused the death of one or more persons each, and 57 caused injury but not death, leaving 102 (51 per cent. of the whole) which caused no personal injury worthy of record.

The comparison with February of the previous four years shows:

	1891.	1890.	1889.	1888.	1887.
Rear collisions.....	47	36	29	30	24
Butting.....	25	30	15	21	31
Crossing and other col- lisions.....	21	8	7	6	2
Derailments.....	93	55	61	104	67
Other accidents.....	10	9	5	13	8
Total.....	196	128	117	174	132
Employees killed.....	52	50	20	21	24
Employees injured.....	161	111	39	90	51
Others.....	114	69	49	65	55
Passenger trains involved.....	85	44	32	70	54
Average per day:					
Accidents.....	7.00	4.57	4.21	5.93	4.71
Killed.....	2.18	1.89	0.82	0.97	1.96
Injured.....	9.82	6.42	3.14	5.66	5.78
Average per accident:					
Killed.....	0.311	0.414	0.195	0.162	0.417
Injured.....	1.403	1.406	0.752	0.953	0.803

The most notable train accident of the month was that in the Fourth avenue tunnel, New York City, which has been discussed in previous issues. No passengers were killed in this collision, but it is gratifying to see that the discussion of the causes and the remedies is taken up as energetically as though the victims had been prominent citizens.

Five passengers were killed or fatally injured at Newton, N. C., on the 16th, by a derailment of a narrow gauge train, resulting apparently from running too fast on a poor track. Only two other passengers were killed, both by causes exceedingly hard to guard against, so far as we can judge by the reports. One of these cases was at Hagerstown, Ind., on the 25th, and the other at Pittsburgh, Pa., on the 16th.

Concerning the collision at Rahway, N. J., on the 17th, it appears that the operator who admitted two trains to the same block carelessly assumed that the freight, after doing some switching (with hand switches) near his tower, would pass from track No. 3 to track No. 4 instead of actually looking to see that such movement was made. The operator at the outgoing end of the section also could have seen that the freight was on the 4th instead of the 3d track, if he had taken the trouble to look.

A Canadian Pacific passenger train was badly wrecked on the 4th, near Schrieber, by the breaking of an axle near a high trestle. The sleeping car was tipped off the trestle and fell 90 ft., injuring 9 of the 15 passengers. The reports say that none of the injuries were fatal, and that the company still preserves its unbroken record, which it is claimed shows that no passenger was ever killed in the cars. At Brockton, Mass., on the 2d, an electric car in crossing the Old Colony Railroad was stopped in some way so that the power could not stir it, and two of the street cars were wrecked by the train. Four ladies were injured. At Cleveland, O., on the 4th, the man in charge of a car cable was unable to stop it, and it ran into a freight train of the Cleveland & Pittsburgh. Not much damage was done. One of the most serious non-fatal train accidents of the month was at Philadelphia, on the 16th, where a number of oil cars were set afire.

In the severe snow storm in the Rocky Mountains on the 8th a Union Pacific passenger train was stalled east of Cheyenne for 36 hours. The blizzard was so furious that passengers dared not move even the shortest distance outside the cars without forming a line. Conductor L. H. Woodmansee in going back to flag the following fast mail train was badly frozen, a result which was almost inevitable in view of the state of the weather at the time. This case has no connection with any train accident so far as we know, but we mention it here because it illustrates one of the difficulties met with in trying to prevent collisions. Doubtless many rear collisions do occur in consequence of the lack of such faithfulness as Mr. Woodmansee's in the men who should prevent them. But the only safe way to run trains during such terrible storms is by the absolute block system.

Although the Fourth avenue tunnel collision has been quite fully discussed it is to be borne in mind that the proposed remedies have been considered with reference to this particular locality. It is well, however, to carefully note the lessons which are applicable to all roads, as a single object lesson like this, which becomes generally known, is a much more effective instructor than a number of lessons which are possibly clearer but are not so well known. Aside from the obvious lesson concerning fires in cars there are three points which come out clearly in this case:

1. Where signals are placed on the left side of the track the fireman should be as carefully instructed as the engineer in his duties as regards the safety of the train.

2. In the operation of a mechanical safeguard, like the Sykes locks, it is essential that the regulations be made so that they can be suspended only by a process involving considerable inconvenience.

3. Do not depend on the flagging rule (No. 99) where it is obviously impracticable to enforce it. The universal answer to critics, by those who do not enforce block systems according to the highest standard of efficiency, is, that the flagging rule is always to be relied upon as a reserve safeguard, and that insistence upon all the fine points, intended to guard against remote contingencies, is, therefore, time wasted. But we have here a plain illustration of the fact—always easily seen but yet persistently ignored—that a perfect flagging rule must provide for the case of a train slackening speed on the road as well as that of one stopping between stations.

The Whitewater division of the Cleveland, Cincinnati, Chicago & St. Louis, a line 70 miles long extending northwest to Hagerstown, Ind., from a point on the Chicago division 17 miles west of Cincinnati, now enjoys the distinction of being one of the few roads—perhaps the only road—in this country doing a general business where "tickets must be purchased before entering the cars." There are only two passenger trains and one mixed train each way daily (20 stations shown in the official guide), and we are not sure but there are occasional exceptions to the rule; in fact, if there are flag stations there must be constant exceptions; but the experiment is nevertheless worthy of note. The superintendent of the division gives the following particulars: "The order requiring passengers to procure tickets before entering trains has been in force for some months, and we are well pleased with the results. The conductor or brakeman politely but firmly requests passengers to show tickets before getting aboard. Where they are not provided with tickets they are informed that they cannot enter, but that the train will be held until a ticket is obtained. For a few days this caused a little delay to trains, but in a short time the traveling public acquiesced in the arrangement, and now no delay is occasioned. The cash receipts on trains at once materially decreased. It takes much less time for the conductor to collect tickets than it does cash fares; he is thus enabled to handle all the short rides, and no one is missed, and he has more time to look after the interests of his train and passengers." Doubtless the trains are short and the time not short, so that a little delay can be easily made up, and most officers would find numerous reasons for regarding the plan as impracticable on their particular road; nevertheless, the superintendent of the Whitewater road feels confident that it could be tried with advantage on almost any line.

The New York Central road and the city of Buffalo have concluded to proceed with a portion of the work involved in the grade crossing reform in that city without waiting for the other roads, whose dilatory tactics are apparently more and more confirmed as time goes on. It will be remembered that the complete plan, drawn up by the engineers of the various roads in conjunction with a commission appointed by the city, contemplates the elimination of all the grade crossings of the streets along the main line of the New York Central from East Buffalo, two miles from the business centre of the city, southwardward one mile, thence west by north one mile to Exchange Street Station (Union Depot), and thence northwesterly across Main street and through the "Terrace," about half a mile. The interest of the other roads in the problem arises from the fact that their lines run parallel to the New York Central, for longer or shorter distances, east of the Union Depot. There are several grade crossings of one railroad with another in this territory, and these would continue in existence even after the execution of the whole plan.

But from Michigan street, which crosses the tracks just east of the Union Depot, westward, no road except the Central is interested, and this portion of the work will be taken up within a month. At Michigan street an overhead bridge of five spans will be built, carrying the street over the tracks. At Washington and Main streets, west of the station, the railroad will also run beneath the highway, and for a short distance under the open square known as the "Terrace," and there will be a covered cut, to be dignified by the name of tunnel. Thence for several hundred feet there will be an open cut for two tracks, and walled at the sides. There will be one overhead footbridge about midway of this cut.

Recent issues of the magazines have contained some unusually good railroad articles. The March *Forum* has a paper entitled "Railways Under Government Control," by Mr. William M. Acworth. Mr. Acworth is well known to many American readers as the author of the "Railways of England," and as a contributor to various journals and has just published a book which will add greatly to the weight of what he writes hereafter. In the March *Atlantic* is a paper entitled "Railroad Problems of the Immediate Future," by Professor A. T. Hadley. The April *North American Review* has an article entitled "The West and the Railroads," by Mr. Sidney Dillon, President of the Union Pacific. In these three articles there is an amount of philosophy and learning, and of clear writing unusual in popular articles on such subjects, and a careful study of them will correct many crudities in the ideas of law-makers as well as of the general reader. The April *Forum* contains an article on "Railroad Passenger Rates," by Professor Hadley, which may be profitably read by those who wish to apply the zone tariff to American railroads. The April *Scribner's* has a paper entitled "Ocean Passenger Travel," by Mr. John H. Gould, which is the first of a series on ocean steamships. It is sketchy but historically interesting, and brings together many facts and data worth knowing and preserving. While not a railroad article it is close kin.

Last October we published a brief account, from private sources, of an expedition through Manchuria, made with a view to the extension toward the northeast of the China Railway Company's line. The expedition went from the head of the Gulf of Leao Tong, by the port of New Chwang and by Moukden and Kirin, to the Russian fron-

tier at Hun Chun on the Tiemen Ho. We were informed that the commission (which included Mr. Kinder and several Chinese officials) would report against building to the Russian frontier, as China would be unable to defend the line in case of war; but that it would recommend building from New Chwang to Moukden, 450 miles. At that time negotiations were going on for a cheap silver loan from America, and the fate of the railroad depended on the success of these negotiations. A letter just received dated Feb. 3 says that a second preliminary survey in Manchuria had just been finished and it is almost decided to build an extension of the China Railway Company's line from Kaiping, 350 miles, northeast to Moukden, and thence to Kirin later. No loan will be made for the purpose, but the government will provide \$2,200,000 per annum. Our correspondent says: "Another line is proposed in the south from Kowloon, opposite Hong Kong to Canton, 125 miles; but I fancy the piratical nature of the Cantonese will hardly permit of its being built. It is a very old scheme. This time it has got as far as the throne."

The directors of the New York, New Haven & Hartford were indicted by the Grand Jury in the Court of General Sessions, New York City, on Tuesday of this week, for misdemeanor in violating the state law forbidding the heating of passenger cars by fires within the cars. There is no indictment for manslaughter, nor any reference to the killing of passengers. The first director who appeared before the judge was admitted to bail in \$5,000. In connection with the announcement of the indictments Dr. Depew publishes a long statement, which contains nothing new except the plea that the delay of the New Haven road in adopting continuous heating is justified by the expressed views of the Connecticut Railroad Commissioners in their reports for 1888 and 1889. As to the 50-mile clause of the New York law, Mr. Depew says that the railroad lawyers have discovered that a suit which has begun several years ago to compel the road to comply with a New York law requiring water tanks in cars was dismissed on the ground that the New Haven road did not have 40 miles of road (the limit named in that law) within the State of New York. The New Haven operating officers, being satisfied from their own investigations and the report of the Connecticut Commissioners to postpone action, the question of heating never came before the Board of Directors.

Test of Steel Tires.

BY E. ROUSSEL,

Engineer-in-Chief of the Belgian State Railroad Laboratories.

The tests to which steel tires intended for railroad service are usually, submitted generally consist of the drop test. In addition to this, some companies prescribe tensile tests on test pieces cut from certain tires offered for acceptance, while others require the flattening of the tire (in a hydraulic press) of from $\frac{1}{4}$ to $\frac{1}{2}$ of their inside diameter. These two last methods certainly give valuable though insufficient data regarding the quality of the metal.

The drop shows that the tire tested is capable of a certain active resistance, and by requiring in addition certain conditions of deformation we are in a position to judge quite accurately of the resisting qualities of the metal. The drop test will also reveal defects that would not appear in the ordinary tensile or compression tests.

It is known that tires wherein the steel contains more than the normal quantity of phosphorus are brittle when cold, and that an excess of silicon is often the cause of fractures at all temperatures. The drop test is not sufficient, in some cases, to weed out the tires with an excess of phosphorus. I have known steel tires containing an average of .15 per cent. of phosphorus to stand the blows of a drop weight, the tests having been made in June and July, that is to say, when the temperature ranged from 65 degrees to 80 degrees Fahr., while the tires thus tested gave a great number of breakages in the severe winter that followed their being put into service. From analyses made upon a large number of these tires, as well as upon others, I have learned that if, at their acceptance, they resisted the blows of the drop weight, it was due to the relatively high temperature, and especially to the fact that the steel contained, only from .15 to .20 per cent. of carbon.

I have also learned that steel containing the same quantity of phosphorus (.15 per cent.) could not resist the drop test even at a relatively high temperature, if it contained as much as .30 per cent. of carbon.

Furthermore, silicon is not without its injurious influence upon the strength of tires. For example, the average amount of silicon contained in 57 tires broken transversely in service was .163 per cent., while the average in tires in service was only .075 per cent. While I would not wish to conclude that silicon is a bad element, I am of the opinion that it is often prejudicial to the quality of the metal, and that this fact is the result of certain imperfections in the processes of manufacture as generally employed. There is no doubt but that the drop test, judiciously made, will eliminate the steel containing an excess of phosphorus and which is unsafe owing to the method of making it. Finally, the average percentage

of silicon contained in tires broken under the drop test was .174.

If the number of breakages is still relatively great in spite of the drop test, it is because the test is usually made on tires taken at haphazard from the invoice. Ordinarily, they take one tire out of a lot of 50 that almost always come from different furnaces. It should be required that each lot should be composed of tires from the same furnace; in this way every furnace would be tested in the invoice, and it should, in my opinion, be an indispensable condition. Finally, to make sure of the quality of the metal from which the tires are made, it is necessary that the drop tests should be graded in proportion to the dimensions of the tires. Furthermore, in order to obtain a steel of sufficient hardness, a maximum limit of deformation under the blow of the weight should be imposed, and a minimum limit to the carbon will advantageously complete the conditions demanded.

With the view to submitting the sections of the tires to a great strain before the drop test, made regardless of their dimensions, I have made the following experiments. I will first consider tires having the same section, and only differing from one another in diameter, as generally obtains in locomotive and tender tires. I had made by the same mill twelve tires of practically uniform section. They were rolled in four sizes, measured by their inside diameters as follows: 73.54 in., 61.1 in., 48.82 in. and 36.46 in. Two tires of each of these diameters were compressed at points diametrically opposite. Measurements were taken of all the deformations corresponding to the successive loads, and the results of these observations are embraced in table A below. The four other tires were subjected to the drop test, as detailed later on.

TABLE A.

Load in lbs.	Flattening in inches according to successive loads.							
	Tires 36.46 in. diam.		Tires 48.82 in. diam.		Tires 61.1 in. diam.		Tires 73.54 in. diam.	
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
11,020	0.036	0.039	0.087	0.083	0.154	0.146	0.212	0.224
22,050	0.075	0.078	0.181	0.161	0.303	0.291	0.421	0.440
33,070	0.118	0.118	0.248	0.236	0.456	0.437	0.646	0.669
44,100	0.154	0.151	0.335	0.315	0.610	0.583	0.937	1.013
55,120	0.189	0.189	0.402	0.390	0.811	0.819	1.287	1.299
66,150	0.239	0.232	0.512	0.477	1.216	1.362	2.378	2.228
77,170	0.272	0.272	0.642	0.633	1.913	2.205	5.516	4.970
88,200	0.323	0.331	0.906	0.908	3.009	4.378	13.122	12.002
89,520							15.524	
92,610							17.941	
101,400	0.397	0.433	1.594	1.787	11.422	13.943		
101,440					13.930			
110,200	0.512	0.554	3.150	3.410				
121,200	0.665	0.835	5.275	6.075				
127,800				9.272				
132,300	0.882	1.418	9.449					
133,400				12.709				
151,300	2.091	3.248						
165,300	3.079	4.603						
176,400	4.264	6.311						
187,400	5.783	8.485						
194,400	7.685							
200,160	8.102							

In the table I have only noted the successive deformations up to the maximum load. Beyond that the tire took the form of a figure 8 and its deformation continued under a continually decreasing load.

It is somewhat difficult to determine the exact point at which the maximum load is attained; for this reason I have decided upon a point that is more easily determined, namely, that which corresponds to a deformation equal to $\frac{1}{4}$ of the inside diameter of the tire.

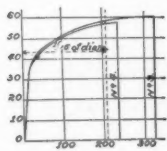


Fig. 1.

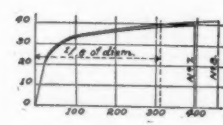


Fig. 2.

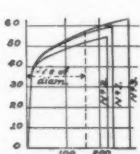


Fig. 3.



Fig. 4.

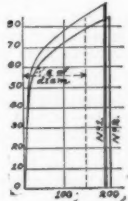


Fig. 5.

Molecular Work of Tires under Compression.

Ordinates = loads in metric tonnes.
Abscissas = deformations in millimeters.

The results set down in the preceding table have enabled me to plot the resistance diagrams (figs. 1, 2, 3 and 4). The ordinates are proportioned to the loads by which the tires were compressed, and the abscissas are the

deformations corresponding to these loads. The area of each of these diagrams represents the molecular work of which each tire is capable at the maximum load, and that at which a deformation of $\frac{1}{4}$ of its diameter is reached.

From a tabulation of the results thus obtained and a calculation of the work in foot pounds expended in causing the deformation of the tires up to the point of maximum pressure, the conclusion is reached that: the molecular work of a tire compressed between two points diametrically opposite is independent of the diameter of the tire for the same relative deformation.

I repeated these same experiments on passenger and freight car wheel tires, except that I was unable to operate upon tires taken from the same furnace as the first, but I selected those that were as much like them as possible. They were from the same mill and intended for the same service.

From the results thus obtained the diagrams of fig. 5 have been drawn similar to those already described, and the molecular work of which these tires were capable can be deduced as before; the metal being practically the same, but with a smaller cross-section. Comparing the two sets of results thus obtained, it will be noted that, for the same relative deformation, the ratio of the work in foot pounds to the modulus of deflection is practically the same regardless of the dimensions of the tire. From which we conclude that the molecular work of a tire compressed between two points diametrically opposite is proportional to the modulus of deflection of the cross-section.

In order to ascertain whether the laws relative to the resistance of the tires which I had deduced from static tests would be substantiated by dynamic trials, I submitted tires of the same diameters and the same sections from the same furnaces to the drop test. These drop tests were made as follows: Each of the locomotive and tender tires received three blows of the weight amounting to 47,741 foot pounds each; that is to say, to practically two-thirds the molecular work corresponding to a deformation of $\frac{1}{4}$ of the inside diameter. For the tires of passenger and freight car wheels, the value of each of the three blows of the weight to which they were subjected was calculated proportionally to the modulus of the sections and relatively to the blow withstood by the locomotive tires.

The resultant equation is $x = 31,611$ foot pounds.

TABLE OF DROP TESTS—LOCOMOTIVE AND TENDER TIRES.

Inside diameter of tire.	Section of tire.	Weight of drop.	Height of fall.	Number of blow.	Diminution of diameter deflection.	Ratio of original diameter to deflection.
Ins.	Ins.	Lbs.	Ft.		Ins.	
73.39	2.79 x 5.55	44.10	10.17	1	4.86	14.01
73.39	2.79 x 5.55	44.10	10.17	2	9.49	7.73
73.39	2.79 x 5.55	44.10	10.17	3	12.08	5.91
60.99	2.75 x 5.55	44.10	10.17	1	4.49	13.70
60.99	2.75 x 5.55	44.10	10.17	2	8.19	7.44
60.99	2.75 x 5.55	44.10	10.17	3	11.54	5.29
48.92	2.75 x 5.59	44.10	10.17	1	3.50	13.91
48.92	2.75 x 5.59	44.10	10.17	2	6.30	7.74
48.92	2.75 x 5.59	44.10	10.17	3	8.82	5.52
36.53	2.79 x 5.59	44.10	10.17	1	2.06	14.27
36.53	2.79 x 5.59	44.10	10.17	2	4.49	8.21
36.53	2.79 x 5.59	44.10	10.17	3	6.22	5.87

From an examination of the two tables and data we have found, 1, that in the case of tires of the same section, but of different diameters, we have the same relative deformation for the same blow of the drop; 2, that for tires of different sections blows proportioned to the modulus of deflection produce the same deformations relatively to the diameter.

We conclude, therefore, that the static tests agree with the dynamic tests, and that the laws deduced relative to the molecular work of the tires can be considered as true within the limits embraced by the tests. This work has served as a basis for the adoption of the following tests, which are required by the inspectors in charge of the acceptance of tires of the Belgian State railroads.

Minimum carbon contained 0.3 per cent.

Drop Test.—1. For locomotive and tender tires three blows of a drop, each equal to 47,741 ft. lbs., and for passenger and freight car wheel tires three blows of the drop, each equal to 23,934 ft. lbs.

After the second blow the reduction in the vertical diameter of the tire must not be more than $\frac{1}{4}$ of the original diameter. (This last clause is not enforced in the case of freight car wheel tires.)

It is also desired that the tires should be selected from lots taken from the same furnaces, and that they should not be collected by chance. We also limit the maximum of silicon to 0.08 per cent.

TECHNICAL.

Manufacturing and Business.

M. Berliner, 69 West street, New York City, the American agent for the Cape Town Government Railroads, shipped this week by the bark "William Phillips," which sailed for the Cape of Good Hope, a lot of machinery for the government railroads, including two mogul locomotives, made by the Baldwin Locomotive Works.

Messrs. Walter Lee Brown and George H. Ellis have formed a partnership under the name of Brown & Ellis, and have opened a laboratory at Evanston, Ill., fully equipped with a complete outfit of modern apparatus, where they will practice analytical chemistry and assays.

ing. Mr. Brown was for three years the chief chemist of the Chicago, Burlington & Quincy, and he was a leading organizer of the American Association of Railway Chemists. Mr. Ellis has been for the past five years actively engaged in laboratory work at the Aurora shops of the Burlington, two years as first assistant to Mr. Brown, and for the last three years as chief of the laboratory.

New Machine Shops.

Plans and specifications have been prepared for new shops to be erected by the Cleveland, Cincinnati, Chicago & St. Louis, at Bellefontaine, O. That town has issued \$100,000 of its bonds to secure the building of the shops. The company at present owns 30 acres of ground, and it is said that it has options on 55 acres additional. Roundhouses, shops and yards will be built, and Bellefontaine will be made a division terminal.

Electric Welding Plant at Pullman.

The Thomson Electric Welding Co. has made arrangements with the Pullman Palace Car Co. for an electric welding plant to be located at Pullman, Ill. The plant will be used for miscellaneous car work, embracing the welding of truss rods and similar work on passenger, street and freight cars. The plant will be installed in about 60 days.

Prince Edward Island Tunnel.

Senator Howland has left Canada for England in connection with the Prince Edward Island tunnel scheme. Sir Douglas Fox is preparing detailed estimates of the probable cost of the undertaking, based on the report of one of the engineers. Mr. Palmer and Mr. Howland have been commissioned by the Prince Edward Island government to cross the Atlantic to furnish Sir Douglas Fox with information concerning the proposed tunnel.

Steel and Iron Axles.

At the March meeting of the Northwest Railroad Club Mr. George Dickson, of the Great Northern Railway, read a paper on axles. His opinion is that the steel driving axle is cheaper than the iron, although, perhaps, not so safe. His failures of iron axles are less from breakage than from seamy defects, which are most apparent in the journal. In the years 1881 and 1882 his road received 131 steel axles and 118 iron axles, under new locomotives of various makes. The first steel axle broke in April, 1888, with a mileage of 148,370 miles. In all, 8 of these axles broke, the last one having a mileage of 270,170 miles. Of the iron axles, 24 have been taken out, 1 broken, and 24 seamy. The mileage ran from 116,319 to 192,777.

Link-Valve Motion Model.

Mr. William Weiler, locomotive engineer, at Port Morris, N. J., furnishes for \$4 a link valve-motion model which he describes as follows: The model shows the left side with its cylinder, steam chest and parts, and the valve with its stem actuated by means of the usual rocker, which in its turn is moved by the eccentric cams on the axle of the driver, through the usual rods and link. It has the main rod attached to an extended crank pin at one end, and to the crosshead at the other, thus moving the piston in unison with the other parts. By means of the reverse lever the motion may be changed, and point of cut-off altered. By a special arrangement the eccentrics can also be "slipped" and re-adjusted. It has a brass frame supported on a neat wooden stand 3 x 7 in., and all the working parts are made of brass. Its length over all is 9 1/4 in., height 5 1/2 in., and thickness of works 1 in. Its driver is 3 3/4 in. in diameter, its piston has 1 1/4 in. stroke and valve 1/4 in. travel.

The Galveston Harbor Improvement.

Bids were opened at Galveston, Tex., March 31, for improving the entrance to Galveston harbor under Government contract. There were seven bids ranging from \$2,000,000 to \$5,000,000. The bidders were: Samuel Hawks, New York; John P. Nelson, San Antonio, Tex.; B. L. Lantry & Sons, Strong City, Kas.; Henry Bennett, Topeka, Kas.; John E. Gayner, Fayetteville, N. J.; Ricker, Lee & Co., Galveston and O'Connor, Laing & Smoot, Dallas. The lowest bid for the sandstone jetty was held by B. L. Lantry & Sons, \$2,849,064; the lowest bid for granite jetty was by Ricker, Lee & Co., \$4,553,940. The contract involves the placing of about 2,000,000 tons of stone in two jetty walls extending out into the Gulf.

THE SCRAP HEAP.

Notes.

The Southern Pacific and Texas & Pacific take their trains to and from New Orleans by boats from a point 20 miles above the city. The regular line will be submerged for some time.

The Northern Pacific has put on a new train from St. Paul to the Pacific Coast. It leaves St. Paul at 9 a. m., and consists of two sleepers, a dining car, one first-class coach, three tourist cars, and baggage and mail cars. It will arrive at Portland at 3 p. m. on the third day. New and handsome cars are used.

A Pittsburgh paper says that the Pullman Company will hereafter reserve no berths in sleepers unless the cash is paid for them. A general order has been promulgated notifying all agents that requests to reserve tickets for berths must not be complied with. An exception is made in favor of railroad men.

The Philadelphia & Reading Railroad's station, offices and ferry house at Kaighn's Point, Camden, N. J., opposite Philadelphia were burned to the ground last Saturday evening. The loss on the buildings will probably be over \$60,000, and on four passenger cars burned from \$18,000 to \$20,000. The buildings are supposed to be fully insured, and will be reconstructed immediately in enlarged and improved form.

The Railroad Committee of the Massachusetts Senate has reported a bill providing that it shall not be lawful for any steam railroad after Nov. 1, 1892, to heat its passenger cars by a stove or furnace kept inside the car or suspended from it, unless such method of heating becomes temporarily necessary by reason of accident or other emergency. The Railroad Commissioners may grant exemptions when necessary or reasonable. The penalty for violating these provisions is a fine not exceeding \$500. It is understood that the Railroad Commissioners favor this bill. A committee of the Pennsylvania legislature has rejected a similar bill.

A Romance from Winnipeg.

The Manitoba & Northwestern and the Canadian Pacific have agents down through North Dakota drumming up settlers for a new colony that is being established at the terminus of the Manitoba & Northwestern at Edmonton. These agents are having a hard time. At

Eureka they were given two hours to get out of town, the citizens threatening to tar and feather them if they did not. The Canadian Pacific agent at Bottineau, just below the Manitoba boundary, was ridden on a rail by the inhabitants, who objected to his proselytizing efforts.

Solid Truth from Cincinnati.

A valuable mare and colt escaped yesterday from the barnyard of Abiah Hayes, the noted stock-raiser, just as a freight train came thundering down toward an adjacent crossing. The colt got in the way of the train and was caught on the cowcatcher, despite the mare's anxious neighing. The long train could not be stopped until it had run the better part of a mile. Then the colt rolled off unhurt. The mare had wildly leaped culverts and crossed fences, and was almost up with the engine when her unharmed colt fell safely down the side of the track. The reporter forgot to add that the mare's exemplary exercise of her maternal instincts deserves the heartiest commendation.

The Economy of Freight Cars of Large Capacity.

The following is an abstract of the report of the Central Railway Club's Committee on Whether Results have shown Economy in the Use of Freight Cars of 60,000 lbs. Capacity for Merchandise, consisting of E. D. Bronner, A. C. Robson and A. Vail. Ten replies were received in response to letters of inquiry sent out. Five roads stated they had used cars of this class extensively, that the carrying capacity is utilized to its utmost limit, that the cost of maintenance is no greater than that of smaller cars, and conclusions based upon practical experience were that they are economical, both from mechanical and operating standpoints. The other five roads owned no cars of the capacity named, and of these, two did not favor them. From statistics furnished by large manufacturing car-builders, the following average prices and weights for 20 and 30-ton cars were derived:

	Total Capacity.	Total Weight.	Total Cost.
3 20-ton cars.....	120,000	72,000	\$1,575
2 30-ton cars.....	120,000	66,000	\$1,300

The comparison shows a saving in dead weight on every 60 tons carrying capacity of 12,000 pounds as well as \$275 in the cost of the cars. In the opinion of the committee the expense in repairs would show a decrease in favor of the 30-ton car—4 c. The three cars required to carry 60 tons will cost more to maintain than the two cars of larger capacity. It might be argued that the larger weights will be more destructive in their effect on the 30-ton cars, but this is not the experience of the roads that have adopted them, as in a well designed wooden car the parts are increased in proportion to the increased strains. The committee was of the opinion that all the arguments brought to bear in favor of the 20 over the 10-ton car, will apply in this case, provided it is admitted that the 20-ton car is not the maximum practical limit.

Historic Painting of B. & O. Directors.

A painting has just been completed by Mr. F. B. Mayer, in his Annapolis studio, representing in a group the originators and founders of the Baltimore & Ohio Railroad, accurate portraits of 29 distinguished men. Prominent among the projectors of the road is Charles Carroll of Carrollton, near the guiding spirit of its early day, Philip E. Thomas, the first President, attentively listening with others to the reading of the charter by J. V. L. McMahon. Represented as factors in the completed work are presidents Swann, Brooks, Harrison and Garrett, grouped with Messrs. Johns Hopkins, J. H. B. Latrobe, A. Schumacher and others, and uniting the two extremes is Louis McLane, an attentive listener to Morse's explanation of the telegraph, first used on the Baltimore & Ohio. Peter Cooper displays a model of the first practical locomotive to Isaac McKim, Fielding Lucas and B. H. Latrobe, and William Patterson, George Brown and B. C. Howard address themselves to the practical duty of inscribing their names as stockholders. Messrs. Alexander Brown, founder of the banking house of Alexander Brown & Sons; Robert Oliver, noted for his public spirit and generosity; Alexander Frigate, Talbot Jones, General McNeill, the first engineer of the road; Thomas Jenkins and others appear in the picture. The only living person presented is the honored J. H. B. Latrobe, whose 88 years allow him to look upon Charles Carroll of Carrollton, recalling the colonial days from 1787 and the throng who have with him become historical. The picture is painted for a number of gentlemen who propose to place it in the directors' room.

Watertown's Modest Wants.

The Watertown Board of Trade has sent H. Walter Webb, General Manager of the Rome, Watertown & Ogdensburg, a number of requests which, while not necessarily "cheeky," may at least be regarded as entirely frank. Certainly no one will accuse the Watertowners of excessive diffidence. In regard to freight transportation, Watertown wants to be placed on the same basis as Oswego, also that such rates may be made as will enable Watertown merchants to establish wholesale houses to compete with Utica, Rome, Syracuse, Oswego and Ogdensburg. Among other things asked is a reduction in the rate of coal from Utica, Syracuse and Waddington to 75 cents per ton; through passenger service, without change of cars, between Utica, Rome, Syracuse, Ogdensburg and Watertown; one express train each way each day, Sundays included; sleeping car to and from New York daily, Sundays included; drawing-room car to and from New York daily; better train service between Watertown and the Thousand Islands by the way of Cape Vincent; make Watertown the headquarters of the Rome, Watertown & Ogdensburg system outside of New York; give authority to some resident general official to hear and speedily redress grievances; withdraw all objections to street railroad crossings; place gates at all crossings where necessary. We suggest that you make an arrangement with commutation tickets on similar plan to those lately granted Utica and vicinity; thousand-mile tickets at two cents a mile; round-trip tickets with adjacent towns, good for a limited time, at two-thirds full fare; cleaner and better coaches and more of them; better facilities for getting on and off trains at Watertown station; place to store packages purchased by non-residents from our merchants; toilet room for ladies; outgoing cars properly labeled; cleaner and more attractive surroundings, etc.

Concession for a Honduras Road.

It is said that the government of Honduras has made a concession to a syndicate of French capitalists for the construction of a narrow-gauge road 93 miles long from the Pacific Ocean to the city of Tegucigalpa. The pro-

posed road will pass through the plains of Choluteca, following the course of the Rio Grande, thus avoiding topographical difficulties in reaching the higher plateaus of Tegucigalpa and those of the interior. The road will touch a number of the most important mining districts and agricultural lands.

The White Line Exprets.

The much talked of "White Train" on the three o'clock New England Limited between New York and Boston went into service on March 16. On that day General Passenger Agent Kendall and a party of railroad and newspaper men made the trip from Boston to Willimantic and returned on the train from New York. The cars have already been described in the *Railroad Gazette*. The novel feature of the train is the outside decoration—white with gold letters and ornamentation. Of the seven parlor cars, three have each a stateroom and 26 chairs in the main saloon, while the other four have 30 chairs each. The New York & New England has provided a dining car of the same general design as the other cars of the train to run between Boston and Willimantic. Buffet smoking cars, decorated in the same manner as the parlor cars, and having 20 handsomely upholstered chairs, will be run for the accommodation of parlor car passengers. Two card tables with fixed seats, and writing desks, with stationery for letters or telegrams, are also provided. These buffet cars are in addition to the ordinary smoking cars. The regular passenger cars seat 60 persons each, and are very comfortable and unusually easy riding. The trains are heated by the Consolidated Car Heating Co.'s disc drum system and lighted by the Pintsch system of gas. The cars have the Wood platform gate, made by the R. Bliss Mfg. Co., of Pawtucket, R. I. The cars were built by the Pullman Co., and are owned jointly by the New York & New England and the New York, New Haven & Hartford. This train is the first passenger train painted white to be run in this country.

The Intercontinental Railroad.

In a few days instructions will be issued to the three parties authorized by the Intercontinental Railway Commission to survey the route of the proposed railroad between the United States and South America. The two civilian parties will leave Washington on April 10 for their field of duty, and will be followed about 10 days later by engineers from the army composing the third party. The civilians will be in charge of Engineer W. F. Shunk; and will proceed to Ecuador to jointly study the lands lying between Quito and Tulcan, in Southern Colombia. Here the parties will divide. One, under Mr. Shunk, entering Colombia at Tulcan, will survey the country in the Rio Plata Valley down to Carthagena; the second party, under Mr. Imbrie Miller, will work south through Ecuador and Peru. The military party, in charge of Captain Steever, will, after reaching Central America, diverge and work north and south. All the parties will receive instructions to make a general inspection of the country, its resources, etc., and will not be confined to the survey of any particular route, the object of the commission being to obtain information regarding the most feasible line for a road.

LOCOMOTIVE BUILDING.

The Schenectady Locomotive Works are running on full time and have turned out 35 locomotives during the month of March, as follows: Sixteen 19 x 24-in. 10-wheel freight and eight 18 x 24-in. 10-wheel passenger for the Chicago & Northwestern; five 19 x 24-in. 10-wheel freight for the Chicago, St. Paul, Minneapolis & Omaha; one 18 x 24-in. mogul for the Bennington & Rutland; one 18 x 24-in. 10-wheel completing an order for 25 for the Atchison, Topeka & Santa Fe; one 17 x 21-in. six-wheel switching engine for the Grand Central station, New York; one 18 x 24-in. six-wheel switching engine for the Fitchburg; two 18 x 24-in. six-wheel switching locomotives for the Northern Pacific Terminal Co.

BRIDGE BUILDING.

Burrill's Rapids, Ont.—A new iron highway bridge is to be built during the coming season over the Rideau River by the united counties of Leeds and Grenville and the county of Carlton. The bridge will have two spans, and it will be 210 ft. in length, with an 18-ft. roadway, and is estimated to cost \$7,500. The plans were prepared by B. J. Saunders, County Engineer. Messrs. D. Ross and J. C. Rutherford are the commissioners from Leeds and Grenville.

Calgary, Can.—The new railroad bridge on the Calgary & Edmonton line over the Bow River at Calgary has been finished. It is over 390 ft. long, and has been built in six weeks. The bridge is supported by two piers and two abutments. The lumber for the entire structure was brought from the Columbia River yards at Beaver, B. C., and amounts in all to 200,000 ft., apart from the trestle work. The bridge at Blindman, 10 miles north of Red Deer, will be built next.

Carrollton, Tex.—A new wooden bridge is being built by the county of Dallas on the Elm fork of the Trinity River, near the junction of Elm Fork and Danton creeks.

Cooper, Tex.—The Cleveland Cable Bridge Co., of Cleveland, O., will, it is reported, receive the contract to construct a bridge across North Sulphur and one across South Sulphur at Cooper.

Eastland, Tex.—The County Commissioners have let the contract for two new iron bridges, one to be built at a cost of \$1,500 on the Leon River on the German and Desdemona road, the other at a cost of \$1,200 on the Cisco and Rising Star road, the King Iron Bridge Mfg. Co., of Cleveland, O., being the contractors.

Elizabethton, Tenn.—A bill has been introduced in the State Legislature authorizing the construction of a bridge over the Watauga River at Elizabethton.

Fort Smith, Ark.—The draw span of the Missouri Pacific Railroad bridge over the Arkansas River at Fort Smith, Ark., was swung into position last Monday, connecting Fort Smith with the Cherokee shore. This bridge is 2,370 ft. long from approach to approach. It cost \$500,000.

Fort Worth, Tex.—The contract for building the large iron bridge over the Trinity River has finally been agreed upon, and the Lane Bridge Co. agrees to complete the work in three months.

Glasgow, Va.—Bids have been received by the Rockbridge Co. for building the bridge across the James River at Glasgow, and the contract will be awarded in a few days. The bridge will connect Glasgow with the property of the East Glasgow Co.

Hastings, Minn.—The contract for building the approaches and piling for the Cedar avenue bridge has been given to Sherwood, Sutherland & Co., of St. Paul.

Leesburg, Va.—A bridge is reported as to be built at Benton's Ford, on Goose Creek.

Niagara Falls, Ont.—The Whirlpool Bridge Co. has asked for authority from the Canadian Parliament power to amalgamate with a New York company and to build an iron railroad bridge across the Niagara River, immediately above the whirlpool.

St. Catharines, Ont.—The St. Catharines & Merrittton Bridge Co. is applying to the Dominion parliament for incorporation to build two bridges over the Welland Canal, one at St. Catharines and the other at Merrittton.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In the Federal Court it is ruled that the issuing of "party-rate tickets," each good for a party of ten persons, at the rate of two cents per mile *per capita*, while single passengers are charged three cents per mile, is neither an unjust discrimination nor an undue or unreasonable preference or advantage within the purview of the interstate commerce act, where such party-rate tickets are offered to the public generally, and where it appears that the rate charged single passengers is not unreasonable.¹

In the same case it is held that the interstate commerce act having adopted substantially some of the provisions of the English railway traffic acts of 1845 and 1854, the construction given to such provisions by the English courts must be received as incorporated into the act.²

In the Federal Court it is laid down that the lessee of a railroad under a lease which all parties admit to be illegal cannot be compelled by *mandamus* to operate such road.³

In the Federal Court it is held that the use of a railroad, though owned by a private corporation, is public to such a degree as to authorize taxation in its support; and Laws Wis., 1883, c. 150, approving and ratifying the act of Douglas County in conveying to a railroad company lands which it held under tax-titles, to aid in the construction of the road through the county, is valid.⁴

Carriage of Goods and Injuries to Property.

In the Federal Court it is decided that where a railroad which has fixed a rate of 20 cents per 100 lbs. for freight from Chicago to New York, and 22 cents for freight from points west of Chicago to New York, of which latter rate said company receives 18 cents, makes an arrangement with a Chicago firm to ship its freight from Chicago to New York at 22 cents under bills of lading purporting to come from western points, and to return to them 4 cents under pretense of paying it to the road bringing the freight into Chicago it is guilty of a violation of the provision of the Interstate Commerce Act of Feb. 4, 1887, which makes it a misdemeanor for a common carrier to charge different rates from those fixed in its schedule.⁵

In Minnesota it is held by the Supreme Court that a bill of lading issued through fraud, mistake or negligence by an agent of a common carrier for property not received subjects the carrier to no liability, even to a *bona-fide* indorsee for value. That the goods were taken from the carrier by one with title paramount to that of the consignor is a good defense to an action by an indorsee of a bill of lading for non-delivery.⁶

In Tennessee the Supreme Court holds that a railroad cannot limit its liability to a shipper for the death of a horse caused by the negligence of the company by a provision in the shipping contract that should damage occur for which the railroad company might be liable, the amount claimed should not exceed, "for a horse or mule, \$100," there being no agreement that this was the value of the horse.⁷

In Georgia it is held by the Supreme Court that where the initial carrier in its bill of lading issued to plaintiffs undertook to transport goods to their destination without any mention of connecting lines, in an action for damages caused by delay against the last carrier, which was not a party to the contract, it is error to instruct that if defendant was one of the connecting lines over which the goods were shipped it would be liable for unreasonable delay, whether such delay occurred on its own line or not.⁸

In Tennessee a bill of lading of cotton gave the railroad company the privilege of compressing the cotton at its own expense for convenience of carriage, and exempted it from loss by fire while at depots, stations, and warehouses. The Supreme Court rules that the company was not liable as carrier for loss of the cotton by fire, not caused by negligence, while stored in a warehouse for compression, though the warehouseman had received the cotton as agent of the railroad company.⁹

In the same case an agreement between a warehouseman and a railroad company provided that the latter would deposit all cotton received by it for shipment with the warehouseman to be compressed, and that he should insure such cotton while in his possession. The Supreme Court holds, that the agreement did not impose upon the railroad company any obligation to insure in event of the warehouseman's failure to do so.¹⁰

Injuries to Passengers, Employees and Strangers.

A Kansas statute provides for an excess of fare by passengers who have no tickets, but declares that the act does not apply when the office was not kept open for the sale of tickets "30 minutes immediately prior to the starting of the train." The Supreme Court rules that where a train was late, and the ticket office was not open 30 minutes immediately before starting from the station, the fact that it was so open immediately before the advertised time for starting gives no right to collect the excess from one who failed to get a ticket.¹¹

In Louisiana the Supreme Court decides that where on being told by an ordinary passenger that he heard an unusually loud noise, and felt a jolt which made the car jump and aroused him, the conductor makes a reasonable inspection, and finds no cause for alarm, he is not bound to stop the train, and his failure to do so will not make the carrier liable for a resulting injury to a passenger caused by a broken wheel.¹²

In Kansas the Supreme Court holds that a railroad which for years has been in the habit of carrying passengers on one of its local freight trains is required to exercise the highest possible degree of care to which such trains are susceptible.¹³

In the Federal Court it is ruled that a palace car company is liable in damages at the suit of a female passenger on whom one of its porters in charge of the car made an indecent assault.¹⁴

In Kansas it is held by the Supreme Court of Appeals that a passenger who refuses to pay fare and persists therein until measures are taken for his expulsion by

commencing to stop the train, becomes a trespasser, and relieves the company of its obligation to carry him; and he cannot reimpose the obligation by a subsequent tender of his fare.¹⁵

In New York a passenger on an elevated train arose as the train approached the station at which she wished to stop, and passed to the door of the car, which the brakeman held open. The jar of the train impelled her to place her hand on the door casing, when, as the train stopped, the brakeman let go of the door, which slammed together and injured her hand. The Supreme Court rules that the brakeman, who had been so seated as that he must have seen that plaintiff wished to get off at the station, was negligent in letting go of the door, in the absence of suitable appliances to hold it from shutting when the train stopped.¹⁶

In Alabama, there being no water in defendant's coach, plaintiff went to the engine to get some, and in attempting to pass from the tender to the platform of the coach he grasped the brake, which was loose, just as the engineer put on the air brakes. The suddenness of the jerk and the turning of the brake caused him to fall between the engine and the coach. Plaintiff knew that there being no steps on the engine he would have to pass over the iron railing to the coach. The Supreme Court holds that his extreme negligence contributing to his injury was a complete defense.¹⁷

In Massachusetts the rules gave as the night signal to "go ahead" a particular motion of a lantern. That was not given. The engineer heard the words "go ahead," and some other words he did not understand, and, without waiting to find what they were, he applied the order to himself, and started his engine and killed a fireman on another engine. The Supreme Judicial Court holds that there was no evidence that the absence of proper rules caused the injury.¹⁸

In Virginia it is decided that a railroad cannot, by contract, exempt itself from liability for personal injuries caused by the negligence of its servants.¹⁹

In Georgia the conductor failed to stop the train at the proper station; thereupon plaintiff went toward the door of the car, which had been left open by the conductor. The conductor then rang the bell, and the train stopped so suddenly that plaintiff put his hand on the facing of the door to steady himself, when the door swung to and cut his finger. The Supreme Court holds the railroad not responsible.²⁰

In the same state the plaintiff boarded a train to seat some member of his family, and remained until the train moved, and then tried to get off while it was moving rapidly and was injured. The conductor did not know that he was on the train. The Supreme Court holds that a nonsuit was properly granted.²¹

In Alabama a switchman for defendant, "off duty," boarded one of its trains of his own accord, and was ordered by the conductor to turn a switch. The Supreme Court rules that the conductor had no implied authority to make such command, and the mere act of obeying it did not constitute plaintiff defendant's employee.²²

¹ Interstate Commerce Commission v. Baltimore & O. R. Co., 43 Fed. Rep., 37.

² Interstate Commerce Commission v. Baltimore & Ohio R. Co., 43 Fed. Rep., 37.

³ People v. Colorado Cent. R. Co., 42 Fed. Rep., 633.

⁴ Northern Pac. R. Co. v. Roberts, 42 Fed. Rep., 734.

⁵ United States v. Michigan Cent. R. Co., 43 Fed. Rep., 26.

⁶ National Bank v. C. B. & N. R. Co., 46 N. W. Rep., 342.

⁷ Louisville & N. R. Co. v. Wynn, 14 S. W. Rep., 311.

⁸ E. T. V. & G. Ry. Co. v. Johnson, 11 S. E. Rep., 809.

⁹ Lancaster Mills v. Merchants' C. P. & S. Co., 14 S. W. Rep., 317.

¹⁰ Lancaster Mills v. Merchants' C. P. & S. Co., 14 S. W. Rep., 317.

¹¹ Atchison, T. & S. F. R. Co. v. Dwell, 24 Pac. Rep., 500.

¹² Irelson v. Southern Pac. Ry. Co. (La.), 7 So. Rep., 800.

¹³ Mo. Pac. R. Co. v. Holcomb, 24 Pac. Rep., 467.

¹⁴ Campbell v. Pullman Pal. Car Co., 42 Fed. Rep., 484.

¹⁵ Atchison, T. & S. F. R. Co. v. Dwell (Kan.), 24 Pac. Rep., 500.

¹⁶ Colwell v. Manhattan Ity. Co., 10 N. Y. (Supp.), 636.

¹⁷ McDaniel v. Highland Ave. & B. R. Co., 8 South. Rep., 41.

¹⁸ Peaslee v. Fitchburg R. Co., 25 N. E. Rep., 71.

¹⁹ Johnson's Adm' v. Richmond & D. R. Co., 11 S. E. Rep., 829.

²⁰ Hardwick v. S. R. & B. Co., 11 S. E. Rep., 832.

²¹ McLaren v. Atlanta & W. P. R. Co., 11 S. E. Rep., 840.

²² McDaniel v. Highland Ave. & B. R. Co., 8 South. Rep., 41.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Concord & Montreal, 3 per cent. on the "B. C. & M. preferred" and "Concord" stocks, payable May 1.

Delaware, Laokawanna & Western, quarterly, 1½ per cent., payable April 20.

Georgia, 2½ per cent., payable April 15.

Norfolk & Western, semi-annual, \$1.50 per share, on the preferred stock, payable April 23.

Raleigh & Gaston, 3 per cent., payable April 1.

Rio Grande Western, quarterly, 1½ per cent. in cash on the preferred stock, payable May 1.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Allegheny Valley, annual, Pittsburgh, Pa., April 14.

Austin & Northwestern, annual, Austin, Tex., May 6.

Catawissa, annual, Philadelphia, Pa., April 7.

Central Ohio, annual, Columbus, O., April 20.

Chesapeake, Ohio & Southern, annual, 58 East Court street, Memphis, Tenn., April 6.

Chicago & Alton, annual, Chicago, Ill., April 6.

Chicago & Grand Trunk, annual, Rialto Building, Chicago, Ill., April 8.

Chicago, St. Louis & Pittsburgh, annual, Indianapolis, Ind., April 15.

Chicago & West Michigan, annual, Muskegon, Mich., April 15.

Cincinnati, Lebanon & Northern, annual, Cincinnati, O., April 14.

Cincinnati, Richmond & Fort Wayne, annual, Richmond, Va., April 7.

Cincinnati, Saginaw & Mackinac, annual, Saginaw, Mich., April 21.

Fort Worth & Rio Grande, annual, Fort Worth, Tex., April 7.

International & Great Northern, annual, Palestine, Tex., April 6.

Joliet & Chicago, annual, Chicago, Ill., April 6.

Junction, special, 22 Fifth avenue, Chicago, Ill., May 5, to act upon a proposed sale of the property and franchises to the Chicago & Northwestern.

Kansas & Arkansas Valley, annual, Little Rock, Ark., April 23.

Lake Shore & Michigan Southern, annual, Cleveland, O., May 6.

Little Rock Junction, annual, Little Rock, Ark., April 23.

Little Rock & Fort Smith, annual, Little Rock, Ark., April 23.

Long Island, annual, Long Island City, N. Y., April 14.

Medicine Hat, special, Toronto, Ont., April 18.

Mexican National, annual, Colorado Springs, Col., April 6.

Michigan Central, annual, Detroit, Mich., May 8.

Morgan's Louisiana & Texas, annual, New Orleans, La., April 6.

Morristown & Cumberland Gap, special, Morristown, Tenn., April 9, to act upon a proposed increase of capital stock.

Newport News & Mississippi Valley, annual, New Haven, Conn., April 11.

New York Central & Hudson River, annual, Albany, N. Y., April 15.

New York, Chicago & St. Louis, annual, Cleveland, O., May 6.

New York & Long Island, special, 22 State street, New York City, April 15, to authorize an increase of the capital stock.

Ohio Southern, annual, Springfield, O., April 20.

Oregon & California, annual, Portland, Or., April 14.

Panama, annual, Mills Building, New York City, April 6.

Pennsylvania & North western, special, Philadelphia, Pa., April 8.

Philadelphia & Reading Terminal, special, Philadelphia, Pa., April 21.

Pittsburgh, Cincinnati, Chicago & St. Louis, annual, 1003 Penn avenue, Pittsburgh, Pa., April 14.

St. Louis & San Francisco, special, Broadway and Pine street, St. Louis, Mo., May 7, to consider a proposed issue of bonds.

St. Louis Southwestern (Missouri), special, Room 14, Equitable Building, St. Louis, Mo., April 21.

St. Louis Southwestern of Texas, special, Tyler, Tex., April 15.

Southern Pacific, annual, San Francisco, Cal., April 8.

Tennessee Coal, Iron & Railroad Co., biennial, Tracy City, Grundy County, Tenn., April 7.

Toledo, Ann Arbor & Michigan, annual, Toledo, O., April 15.

Traverse City, annual, Traverse City, Mich., May 7.

Unadilla Valley, special, 80 Broadway, New York City, April 15.

Union Pacific, annual, 101 Tremont street, Boston, Mass., April 29.

Union Pacific, Denver & Gulf, annual, Denver, Col., April 14.

Valley (Ohio), annual, Cleveland, O., April 15.

Wheeling & Lake Erie, special, Toledo, O., April 15, to vote on a proposed increase of the capital stock.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *General Time Convention* will hold its spring meeting in New York City, April 8.

The *Master Car Builders' Association* will hold its annual convention at the Stockton Hotel, Cape May, N. J., commencing June 9.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwestern Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union Station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York. The annual convention will be held at Lookout Mountain, Tenn., commencing about May 30.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 112 Girard street, Philadelphia, on the first and third Saturday of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursdays at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 30 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regu-

lar meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The American Society of Swedish Engineers holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The Engineers' Club of Minneapolis meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

Rensselaer Polytechnic Institute.

A lecture on "Some Methods of Meeting the Ordinary Requirement of Railroad Maintenance" was delivered March 24 before the students of the Rensselaer Polytechnic Institute by A. J. Swift, C. E., the chief engineer of the D. & H. Canal Company's railroads.

PERSONAL.

—Mr. John R. Turner, of Louisville, Ill., recently nominated by Governor Eifer as one of the Railroad Commissioners of Illinois, has been confirmed by the State Senate. The commissioners have re-elected Isaac N. Phillips, Chairman of the Board.

—Mr. John M. Douglas, a former President of the Illinois Central, died in Chicago, March 26, of pneumonia. He was 60 years old. In 1857 Mr. Douglas was appointed General Solicitor of the Illinois Central road. He became Vice-President and President of the company, retiring finally in 1876. In 1881 he was appointed receiver of the Ohio & Mississippi.

—Mr. S. Y. McNair, who has been Treasurer and Auditor of the Interstate Commerce Railway Association for the last two years, has resigned that position. Mr. McNair is one of the ablest railroad accountants and statisticians in the country. He has had a very extensive experience, and was Chief Clerk for the Comptroller of the New York, Lake Erie & Western for 16 years previous to April, 1880, when he resigned to go to Chicago.

—Mr. F. E. Morse, at one time General Western Passenger Agent of the Lake Shore & Michigan Southern, is manager of the New Jersey Car Service Association, with headquarters in New York City. The operations of this association will, in a month or two, be extended so as to include New York City. Besides the large terminals of the New York Central, the Pennsylvania, the Erie and the West Shore have yards in the city, to which they bring cars by boat.

—Mr. Charles H. Oler, of the Cleveland and Chicago route, took the Postmaster General's gold medal for the best record in the Railroad Mail Service for the year 1890. Mr. Oler distributed 21,649 cards at the rate of 25 a minute with only 12 errors, 1 of 1 per cent. He made but two errors in Nebraska, two in Indiana, three in New York, two in Illinois, two in Minnesota and one in South Dakota. In Ohio 3,049 cards were thrown and not an error occurred; in Wisconsin, 1,649 and no errors; in Iowa, 1,788, no errors; in Michigan, 1,809, no errors, and perfection was also attained in Connecticut, Massachusetts, Vermont and New Hampshire. Mr. Oler is 26 years old, and was an Indiana farmer and school teacher. He has now been given a clerkship on a Transatlantic steamer, where mail-sorting has just been established.

ELECTIONS AND APPOINTMENTS.

Barberton Belt Line.—The following are incorporators of this proposed Ohio belt road: O. C. Barber, Charles Baird, Wm. McFarlin, Edwin F. Voris, and H. A. Robinson, all of Barberton, Summit County, Ohio.

Broadway & West Virginia.—The directors and officers of this road are: F. H. Skeele, Charles Gallagher, James H. Moran, Daniel G. Thompson, H. C. Henderson and Herbert L. Bridgman, New York; and E. D. Root, P. W. Pugh and W. H. Gardner, Broadway, Va.; President, F. H. Skeele, 38 Wall street, New York City; Vice-Presidents, E. D. Root, and Charles Gallagher; Secretary, P. W. Pugh; Treasurer, James H. Moran, 38 Wall street; Chief Engineer, Capt. Geo. C. Dickinson, Broadway, Va.; and Solicitor, Hon. George R. Calvert, New Market, Va.

Dun Glen.—The incorporators are: J. F. Brown, M. Jackson, C. B. Couch and Joseph Ruffner, of Charleston, and N. M. Jenkins, of Fayette County, W. Va.

Eastern Central.—The following are the directors of the consolidated company: John Lee, M. Deal, H. C. Carhart, Jacob Riblet, F. A. Keen, A. C. Squires and Isaac C. Elston. Executive Committee: John Lee, A. C. Squires, H. C. Carhart, F. A. Keen and Dr. C. Coyle. The names of officers were published last week. The office of the company is at Gallion, O.

Georgia, Tennessee & Illinois.—The following were named as directors in the charter filed in Alabama, March 27: R. L. Spencer, J. H. McBride and J. C. Kibbey, of Tallapoosa, Ga.; A. J. McBryde and J. A. Burns, of Atlanta, and W. B. Thomas, of Tennille, Ga.

Louisville, New Albany & Chicago.—An adjourned meeting of the stockholders was held in New York City, March 30, and the entire board of directors resigned. To succeed the old directors the following were elected to the board: Samuel Thomas, John Greenough, Calvin S. Brice, James E. Grannis, F. K. Sturgis, C. Weidenfeld, E. K. Sibley, W. A. C. Even, W. L. Breyfogle, Herman H. Campbell, E. D. Hawkins, G. B. Shaw, and John B. Hughes. The five last-named directors were members of the old board. The new board accepted the resignations of President W. L. Breyfogle and Vice-President George F. Postlethwaite, and abolished the office of Second Vice-President, the incumbent of which was Mr. Hiram W. Hunt, of New York. Gen. Thomas was elected President and John Greenough Vice-President. The title of Assistant to the President was created, and ex-President Breyfogle was appointed to that office.

Middleborough Belt.—The following are the officers of this road: Alexander A. Arthur, President; J. W. Wilson, Vice-President; Frank J. Hoyle, General Manager; C. H. Waring, Chief Engineer; Jno. B. Cary, Treasurer, and E. E. Malcolm, Secretary. The office of the company is at Middleborough, Ky.

Mount Carmel & Natalie.—The incorporators of the company are as follows: John McGinnis, Jr., New York City, President; Nathaniel Taylor, Wilkes Barre; R. E. Patterson, F. E. Patterson and O. W. Wood, Philadelphia; J. G. Case, New York City, and A. B. Cochran, Pottsville, Pa.

Northern Pacific.—E. H. Forester has been appointed General Agent of the freight department at San Francisco.

Northern Steamship Co.—L. W. Lake has been appointed Eastern Agent, with office at New York City, vice L. S. Greves, General Eastern Agent, resigned.

Pittsburgh, Washington & Southern.—This company was chartered in West Virginia last week by T. M. Jackson, Clarkburg, W. Va.; C. W. Cowan, J. H. Furbee and A. N. Prichard, Mannington, W. Va., and Thompson Stroanzyder, Blacksville, W. Va.

Pittsburgh, Wheeling & Kentucky.—The annual meeting was held in Pittsburgh, March 26, and the following directors were elected: C. D. Hubbard, John McLure, Joseph Speidel, H. K. Liet, James McCrea, and T. D. Messier.

Port Angeles & Southern.—The incorporators have elected the following trustees, to serve until Sept. 2 next: Lauren Ingels, C. E. Mallette, N. M. Singleton, W. C. Williams and F. S. de Wolfe. The principal office will be at Seattle, Wash.

Rapid City, Missouri River & St. Paul.—The company was organized at Rapid City, S. D., March 24, with the following board of directors: R. C. Lake, H. O. Hall, F. R. Davis, V. L. McGillycuddy, Eugene Holcomb, William Gramberg, H. C. Clay, R. B. Hughes, J. R. Brennan, Myron Wilsie, James Holley, J. W. Fowler and B. L. Price, all of Rapid City. M. Wilsie is Chief Engineer.

Uniontown & Lick Run.—The incorporators of this Pennsylvania company are: John Boyle, Edgar Boyle, Chas. E. Boyle, Robt. J. Haldeman, Jas. R. Barnes, Wm. C. McKean and Isaac W. Semans, all of Uniontown.

Watauga Valley.—The following are the officers of the company: George C. Potts, President, South Watauga, Tenn.; H. S. Chase, Vice-President, Boston, Mass.; J. W. Caldwell, Secretary, Knoxville, Tenn.; W. T. Robinson, Treasurer, 333 Walnut street, Philadelphia, and J. R. Engelbert, Chief Engineer, South Watauga.

West Virginia Central.—At the annual meeting at the office, No. 1,727 North Tenth street, Philadelphia, Alexander Boudroun was re-elected President and Treasurer; F. F. Clark, Vice-President and Secretary and H. H. McWhorter, Charleston, W. Va., Attorney.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Birmingham, Sheffield & Tennessee River.—The survey will be commenced this week for the proposed branch west from Sheffield, Ala., the present northern terminus of the line, to Margerum, Ala., a distance of 22 miles. It will parallel the Memphis & Charleston the entire distance. The branch will be built to connect the main line of the road with the branch which extends from Margerum to Riverton, Ala., on the Tennessee River. The object in building the line is to reach the Tennessee River at a point where there is navigation the year round. The money for the construction of the branch has been raised, and work will be commenced as soon as possible.

Boston & Maine.—Work was commenced last week for a second track on 13 miles of the eastern division. The present double track now ends at Ipswich, 28 miles from Boston. The contracts for the new work have been let, and the track is to be finished early in the summer. During the winter the contractors have been removing ledges and other obstructions. The rails are now on the ground, and will be laid as soon as the contractors finish the grading.

Broadway & West Virginia.—The preliminary survey has been completed through Rockingham County, Va., from North River Gap, W. Va., to Broadway, Va. The line will be about 20 miles long. It passes through mineral and timber lands in Brock's Gap Valley and easterly through Powell's Fort to Timberville and New Market. The line will also be surveyed from Broadway to Riverton. The Virginia Land & Improvement Co., will build the road. F. H. Skeele, 38 Wall street, New York City, is President.

Buffalo, Thousand Islands & Portland.—Before the Rome, Watertown & Ogdensburg passed into the control of the New York Central & Hudson River road it projected a line from Suspension Bridge to Buffalo. It is understood that this road will be built, an agreement having been reached between the New York Central and Lehigh Valley, which had a half interest in the line. The Rome road expended about \$800,000 in rights of way, and the completion of the road will involve expenditures of \$1,000,000 or \$1,200,000 additional. It is about 25 miles long.

Butte Creek & Molalla.—The company filed articles of incorporation in Oregon last week. The capital stock is \$250,000. The road which is proposed is to extend from Salem northeast to Mt. Angel, east to Butte Creek, southeast to Scott's Mills, Wilbitt Springs, and thence north to Molalla and Oregon City. R. W. Scott, R. Thompson, W. G. Minier, J. P. Ridings, F. W. McLearn are the incorporators. The office of the company is at Butte Creek, Clackamas County, Or.

Canadian Roads.—Application is being made to the legislature of British Columbia for a charter to build a road from the Canadian Pacific near Spence's Bridge along the Nicola River, through Princeton, to Osayoo Lake, and also from a point on the Cold Water River to Kamloops.

Chattanooga Southern.—The route of the proposed extension to connect with the East & West of Alabama will be from Leesburg, a few miles north of Gadsden, Ala., the present terminus of the line, across the Coosa River near Round Mountain, and thence directly south to Langdon City, on the East & West of Alabama. The connection is made at a new town, situated near Piedmont. It is proposed to run trains through from Chattanooga to Birmingham, and the line between Leesburg and Gadsden will then be operated as a branch.

Chesapeake & Ohio.—A local paper states that the company proposes to build a belt line around Richmond, Va., outside the belt road built last year by the Richmond, Fredericksburg & Potomac and the Richmond & Petersburg. It is stated that the exact route has not yet been determined, but that the company expects to complete most of the construction work this year. The line will be several miles from the centre of the city, and as the country is not very thickly populated, it is expected that the company will have little of the trouble over right of way experienced by the Richmond & Petersburg in building its belt line. The new belt line will be east of Richmond, and will extend from a connection with the old Richmond & Allegheny road, now the James River

Division, to the main line and to the Newport News Division.

Coburg, Northumberland & Pacific.—This company is applying to the Dominion parliament for power to build branches from its surveyed line northerly to the mineral land in the counties of Peterborough and Hastings, to reduce the capital stock of the company, to increase the bonding power of the company from \$6,000 per mile, and to extend the time for commencing the work of constructing the road for two years.

Concord & Montreal.—Work was commenced last week on an extension of this road called the Manchester & North Weare, which is to extend from North Weare northwest to Henniker, N. H., a distance of less than 10 miles. The new road will connect with the Boston & Maine at Henniker, and it may be extended from that point to Bradford. A former line between the two points was abandoned in 1858.

Dayton, Lebanon & Cincinnati.—The company has been chartered in Ohio for the purpose of constructing or acquiring by purchase or lease a road between Dayton, O., and Cincinnati. The plan is to build 6½ miles of road from the Union station in Dayton to Beavertown, connecting with the road owned by Henry Lewis, of Dayton, which is 17 miles in length and extends to Dodd's Station, about six miles north of Lebanon. From Dodd's Station 10½ miles of road is to be built to Hageman, where connection will be made with the Middletown & Cincinnati, now under construction from Middletown to King's, on the Little Miami. The right to operate under a lease or traffic arrangement from Hageman to Cincinnati, via the Middletown branch and Little Miami, is to be negotiated.

Duluth, Pierre & Black Hills.—The grading is to be resumed in a few weeks between Faulkton and Pierre, S. D., a distance of about 70 miles. Bonds will be issued by the latter town to pay for the construction of this division. The road was graded last year between Faulkton and Aberdeen, about 45 miles. It is claimed that the track on the entire line will be laid this year. The Northern Pacific will operate the road when it is completed.

Dun Glen.—The charter for this company was filed in West Virginia last week. The capital stock is \$200,000. The road will extend from the mouth of Lower Long Creek at Deep Water, in Fayette County, up that creek, Arbuckle Creek, Dun Loop Creek and Pony Creek, and from thence to the point where the state line crosses the Bluestone road in Mercer County. The office is to be at Charleston.

Eastern Central.—The incorporation of this company in Ohio was noted last week. It is a consolidation of two roads heretofore incorporated, the Gallion, Logansport & Chicago, which had a charter for a road from Gallion through Logansport, Ind., to Chicago, and the Eastern Central, which had a charter for a line extending east from Gallion through the coal fields to Bowerston, O., or a point in that vicinity, connecting with a line to Pittsburgh. Very little surveying has been done on either of the lines, but the officers of the consolidated company state that a survey will be commenced immediately for the division from Gallion eastward, and it is hoped to begin grading on this division the present year. Col. John Lee, of Crawfordsville, Ind., is President, and H. C. Carhart, of Gallion, O., is Vice-President.

Flint & Pere Marquette.—It is the intention of the company to soon begin the construction of its proposed Detroit branch, which is to give it an independent line to Detroit. The tracks of the Michigan Central are now used. The new branch has been located from West End avenue in Springwells, a point on the Wabash 3.96 miles west and a little south of the Fort Street Union Depot, thence west and northwesterly for a distance of nine miles, to the intersection of the Detroit, Lansing & Northern 13 miles from the Detroit Union Station and at a point 1½ miles east of Redford station, in Redford Township, Wayne County. From this point northwest the route has not been determined. It will go either to Northville or Novi. The country is level and the work very light, as to grading and bridging.

Georgia Northern.—A special charter has been applied for from the Georgia Legislature, authorizing this company to construct a line from Dalton, or Cohutta junction, through the counties of Whitfield, Murray, Gordon, Gilmer, Pickens and Cherokee, the terminus being at Ball Ground. W. C. Tilton, J. W. Gould and N. C. Granger are incorporators.

Georgia, Tennessee & Illinois.—A new charter was filed March 27 with the Secretary of State of Alabama, by this company, which has been surveying its route through northwest Alabama for the last year. The line in the state will extend from a point on the state line in either Cleburne or Cherokee county, through the counties of Cleburne, Cherokee, Calhoun, Etowah, De Kalb and Jackson to the town of Stevenson, in Jackson County.

Grafton & Greenbrier.—The Baltimore & Ohio is said to have agreed to widen this road from 3 ft. gauge to standard gauge this summer. The line extends from Grafton to Bealington, W. Va., 24 miles. The West Virginia Central & Pittsburgh is to be extended to Bealington, the southern terminus, and it is proposed to run the trains over the Grafton & Greenbrier road to Grafton, and thence over the Baltimore & Ohio to Pittsburgh.

Hoosac Tunnel & Wilmington.—The Railroad Committee of the Massachusetts House of Representatives has reported the bill to authorize this company to purchase the Deerfield Valley road in Vermont, and to extend its road from Readsboro north to Wilmington, Vt., about 10 miles.

Interoceanic.—The last rail on the division between Vera Cruz and Jalapa, Mexico, a distance of 35 miles, was laid on March 21. The division from the City of Mexico to Jalapa has been in operation since last fall. There is some ballasting and other construction work uncompleted on the section east of Jalapa, but it is expected that trains will be run through from the capital to the Gulf of Mexico this week. The freight trains will be run regularly on the new section some time this month, but the line will not be opened for passenger traffic before May 5. East of Jalapa the contractors have had to do a great deal of rock excavation, which has delayed the tracklaying. There is still mud earth and rock from the cuts to be removed.

Joliet, Lisbon & Western.—The articles of incorporation of the road have been filed in the Recorder's office in Joliet, Ill. The projectors have completed a survey of 160 miles west from Joliet via Lisbon, Ill.

Lake Erie, Essex & Detroit.—This company is asking for power to extend its road to the town of Simcoe,

Ont., and for an amalgamation with the Lake Erie & Detroit River Co., chartered in Ontario.

Latta & Bennettville.—The survey has been made from Latta through Marlboro County, S. C., as far as Dunbar's, and the engineers are now running the line to Bennettville, S. C., which will be reached in a short time.

Louisville & Nashville.—The track on the Cumberland Valley branch has been laid to near Big Stone Gap, Va. The stations have been erected along the line as far as that point, and trains will probably be put on to Big Stone Gap in a few weeks. The extension is now being operated to Shawnee, a few miles east of Cumberland Gap, Ky. The grading has been completed for about 24 miles east of Big Stone Gap toward Norton.

Macon, Dublin & Savannah.—The first division of the road from Macon westerly to Jefferson, Ga., 24 miles, will be placed in operation about April 5. The tracklaying is in progress through Twiggs County, and it is expected that the road will be completed as far as Dublin, 30 miles beyond Jeffersonville, by May 1. There are seven stations on the first section of the line. The first station from Macon is Swift Creek, seven miles; Dry Branch, nine miles; Burkett's, 12 miles; Fitzpatrick, 15 miles, and Marion, 18 miles.

Manistee & Grand Rapids.—Several surveys have been made during the winter from a point south of Manistee, Mich., near the Sauble River, through Newaygo County, and also southeast to Luther, on the Grand Rapids & Indiana. It is stated that the directors have decided to begin the grading before spring, and that it is likely that they will adopt the route to Luther, crossing the Chicago & West Michigan north of Grand Rapids.

Mexican, Cuernavaca & Pacific.—This company was incorporated in Colorado last week. The capital stock is \$2,000,000. Gen. Herman Strum, of Indiana, obtained the concession for the line last summer. The Mexican government grants the right of way and exempts the company from taxation for 30 years. It is stated that work on the line will begin in a few weeks. A survey has been made. The line will extend from the City of Mexico to Cuernavaca, and east through a fertile region for a distance of 220 miles. The incorporators are Gen. Herman Strum, Gen. G. Fritch, Charles Wheeler, Andrew B. Heath and Philip Seang. The officers are George Fritch, President; Gen. Strum, Vice-President and General Manager; Charles Wheeler, Secretary; A. B. Heath, Treasurer, and John T. Butman, of Saratoga, N. Y., Superintendent of Construction.

Mexican Roads.—A company is said to have been organized in London by Col. Owen to build a standard gauge road from the town of Presidio de Rio Grande to Topotobampo. The concession for this line, granted to Col. Owen a year ago, carries with it important land grants.

Middlesborough Belt.—The work has just been started on the grading for the branches recently put under contract. The contracts for the six miles have been let to McFarland, Walton & Co., of Knoxville, Tenn., as already stated. One of the branches will leave the Bennett's Fork Branch, and extend to coal mines on New Cabin Fork. The second branch is four miles long, and connects with the main line following Stony Fork Creek to new coal mines and coke ovens. All the surveying has been completed. The maximum grade will be 185 ft. per mile, except for a short distance, where there will be a grade of 210 ft. to the mile. The maximum curves are 12 degrees.

Minneapolis, Sault Ste. Marie & Atlantic.—The right of way is said to have been obtained during the last few months for the proposed extension from Hankinson through North Dakota for nearly 100 miles in the direction of Regina. The extension was graded for about 40 miles northwest of Hankinson last year to near Sheldon. It is now reported that the engineers will soon resume the survey beyond Sheldon, and that the contracts will be let this summer for grading the line to a point about 90 miles beyond Hankinson. The track will probably be laid on the section already graded.

Montana & Wyoming Eastern.—About 80 miles of the route through Montana has been surveyed during the last winter. Castle Mont., is to be the terminus. W. S. Cox, one of the directors, outlines the survey as follows: Entering from Wyoming, it crosses the Crow reservation, striking Yellowstone County at or near Billings; continuing north it enters Fergus County, to Lewiston, and from that town the route will be southwest to Castle, then by Sixteen Mile Creek to Helena.

Monterey & Mexican Gulf.—All the track has been laid south of Victoria, Mex., with the exception of the last few miles near Tampico, the southern terminus. The contractors expect to finish the tracklaying soon after the middle of the month, when trains will begin to run from Trevino on the International & Great Northern. The trains are now running to La Panocha, 88 miles beyond Victoria and 300 miles southeast of Trevino.

Mount Carmel & Natalie.—J. C. Stanton & Co., New York City, are the contractors for this road. It is to be completed by July from Mount Carmel to Natalie, Pa., six miles, to reach large coal mines. A. B. Cockran, of Pottsville, Pa., is Chief Engineer.

New Roads.—W. B. Hayes, of New York City, and Adam Littlepage, of Cleveland, O., have been granted a franchise by the County Court of Kanawha County, W. Va., for a road extending from a point on the Kanawha & Michigan, near Kanawha, to the Jackson County line, a distance of about 12 miles. Surveys have already been made for this part of the line, and a company is now being organized to complete the grading. The line will probably be extended to the Ohio River at Ripley.

The Shenandoah Land & Improvement Co., has had a survey made recently for a road from Shenandoah in Page County, Va., on the Norfolk & Western westerly to Harrisonburg on the Baltimore & Ohio, a distance of about 15 miles. A feasible route was found on the reconnaissance and the construction work will be comparatively light. C. Powell Noland, of Shenandoah, Va., is president of the Shenandoah Land & Improvement Co., which will probably build the line.

A survey will be made for a branch from Easley, on the Charlotte & Atlanta division, north to Pickens, S. C., in the northwestern part of the state. It is understood that the company agrees to lay the track on the branch, and to operate it if the towns will secure the right of way and complete the grading.

Chesterfield County, S. C., will hold an election in April to decide as to the issuance of \$100,000 of bonds, \$50,000 of which is for a road from Cheraw to Lancaster, and the remainder for a road from Cheraw to Camden.

The last general assembly of Alabama appropriated \$9,000 for the survey for a road to connect the Tennessee River with the Gulf of Mexico. Ex-Governor Seay, John T. Milner, and R. L. Simpson, who were appointed a commission to locate the route and have the survey made, have concluded to make the survey between Florence and Mobile, going through the Warrior coal fields from north to south, and through the following counties: Colbert, Franklin, Walker, Jefferson, Tuscaloosa, Pickens, Hale, Marengo, Clarke, Washington and Mobile.

Northern Pacific.—The contractors have forces at both ends of the branch which is being built in western Washington between Chehalis and South Bend, but the country between the two terminals is in a bad condition from the heavy rains and is almost impassable. The road will be completed during the summer. The line between Montesano and Ocosta, Wash., is practically all graded, and the rails will soon be laid. An iron drawbridge 200 ft. long will be built across the Chehalis River, a short distance below Cosmopolis. Work on the Green River & Northern cannot be resumed until dry weather. King & Dickinson, the contractors, expect to finish the work in June. Surveys have been run between Grand Coulee, in eastern Washington, and the Columbia River toward the mining districts. These, however, are entirely preliminary, the object being to ascertain what such a line will cost.

Oxford & Coast Line.—The town of Oxford, N. C., will hold an election on May 25, to consider the issuance of \$40,000 bonds to subscribe to the capital stock of the company lately incorporated to build from Oxford through Granville County to Nashville, on the Atlantic Coast Line.

Paducah, Tennessee & Alabama.—The company has about 100 men employed on the stations and other terminal work at Paris, Tenn. The grading for the extension south of that point has not yet been started, and the company may postpone the award of the contracts for several months. The preliminary surveys have been made for some distance south of Paris, but no other work has been done. The country is near the Tennessee divide, and is very rough and broken. The maximum grade will be 32.8 ft. per mile, but it will require very heavy work to maintain this grade. The maximum curvature will be six degrees.

Pajaro Valley.—The rails were received at Santa Cruz last week for the section of this road from the present end of track near the Moro Cojo Ranch south to Salinas, Cal., on the Southern Pacific, a distance of about 13 miles. The line begins at Castroville, and some track was laid south of that town last year. The road is being built to convey freight to the Spreckels sugar refinery near Castroville. The company will probably run passenger trains from Castroville through Watsonville to Salinas about the middle of June. A further extension of the line is proposed from Salinas south about 18 miles to Gonzales.

Pennsylvania & Northwestern.—Keller & Crossan, of Lancaster, Pa., have been awarded the contract for the grading for the second track which is to be built between Lloydsville and Irvona, Pa., a distance of 17 miles. The surveys have been completed for the entire work, and the contractors now have about 500 men engaged on the grading. This work will not be very heavy.

Philadelphia & Reading.—Passenger travel on the extension of the Northeast Pennsylvania from Harts-ville to New Hope, Pa., on the Delaware River, 16 miles, was formally inaugurated on March 30. All the track on the line was laid last year and freight trains have been running since that time.

Pittsburgh, Washington & Southern.—The company has been chartered in West Virginia to construct a road from Blacksville, Monongalia County, by way of Mannington, to Clarksburg. The office is at Mannington. The capital is \$5,000. The incorporators are: T. M. Jackson, Clarksburg, W. Va.; C. W. Cowan, J. H. Furbess, and A. M. Priard, Mannington, and Thompson Strodsner, Blacksville, W. Va.

Port Angeles & Southern.—Articles of incorporation have been filed in Washington by Lauron Ingels, M. M. Singleton, W. C. Williams and F. S. De Wolfe, of Seattle, Wash., and C. E. Mallette, of Port Angeles, Wash. The capital stock is \$2,500,000. It is the purpose of the incorporators to build a road from Port Angeles over the most feasible route to Port Discovery Bay and Port Townsend, thence in a general southerly direction to Gray's Harbor.

Rapid City, Missouri River & St. Paul.—The organization of this company was effected at a meeting at Rapid City, S. D., March 25. The directors elected have subscribed for \$51,000 of the stock, and the engineers will begin the surveys from Rapid City before the end of April.

Richmond & Danville.—The work on the branch from Winston southwest is being pushed rapidly, and the track will probably be laid to the Yadkin River before April 5. About three-quarters of a mile of track is being laid daily. A large bridge will be built across the Yadkin River, and this will delay the work on the last half of the line to Mocksville, N. C., which is about 20 miles southwest of Winston.

Rio Grande Western.—The directors have announced that it has been decided to issue 12,500 shares of the preferred stock still in the treasury. It will be offered at \$65 a share to preferred and common stock holders. All the stock that may not be taken by stockholders has been subscribed for. Many improvements are contemplated, the chief being the construction of a new line over the Soldier Summit Pass which will reduce the grade from 200 ft. a mile to 100 ft., at an expense of \$300,000. The shop in Salt Lake City will be enlarged, and for these and other purposes \$800,000 will be required. Part of this amount will be for new equipment.

St. Louis Merchants' Bridge Terminal.—Last week about 400 citizens of St. Louis, by invitation of the St. Louis Merchants' Bridge Co., took part in an excursion over the company's road, which was made the occasion of the formal opening for passenger traffic of the road through St. Louis, the Missouri River Bridge and the lines on the east side of the river. The bridge structure proper consists of three spans, aggregating 1,000 ft., equally divided, each span being 52 ft. above high-water mark. On each end are steel viaducts 425 ft. long, resting on solid piers. The track strikes the surface soon after leaving the bridge at both ends. On the Missouri shore the right of way extends through the streets of St. Louis to Carr street, where the elevated structure begins; this continues 8,300 ft. along the river front, curving at Poplar street diagonally into Mill Creek Valley, where

all the railroads centre. In addition to this trackage, extensive yards are owned on both sides of the river; also a strip of land 200 ft. wide, from Madison to Kinder station on the north, two miles distant, where the Alton, Jerseyville, Toledo, St. Louis & Kansas City, St. Louis & Eastern and other roads enter. The lease of the belt line, formerly known as the Venice & Carondelet road, by the Terminal company, furnishes a connection from Madison on the north to the Mobile & Ohio on the south, crossing, as it does, every road entering East St. Louis. This road passes in close proximity to the National Stock Yards and is east of East St. Louis. The track has a 67-lb. rail. To accommodate the passenger traffic stations will be erected in St. Louis at Gratiot, Fourth, Olive, Carr and North Market streets and Bremen avenue. Freight stations will also be built above Carr street. The company owns eight Baldwin locomotives and four passenger cars. There has already been expended the proceeds of \$3,000,000 of first mortgage six per cent. bonds and \$3,000,000 of stock. In addition to this sum about \$1,000,000 more will be required, provision for which has already been made.

Silver City & Northern.—The articles of incorporation were filed in New Mexico last week. The capital stock is \$100,000, and one-fifth of this amount has been subscribed. The road is to be built between Georgetown, in Grant County, and Whitewater, on the Atchison, Topeka & Santa Fe. Lawrence Perkins, Robert P. Perkins, of New York; Thomas J. Condon, Henry F. Grierson, of Las Vegas, and G. G. Posey, of Silver City, are the incorporators.

South Florida.—The proposed extension of this road from Pemberton has been surveyed as far north as High Springs, Fla., on the Savannah, Florida & Western, a distance of about 90 miles. The general character of the work is light, and the maximum grade on the extension will be 1 ft. in 100, and the maximum curve five degrees. It is not decided when the contract will be let for grading the line. The survey from Pemberton is in a generally northern direction, and passes through the towns of Arlington, Hernando, Tompkinsville, Dunnellen, Morganville and Albion. The line crosses the Florida Central & Peninsular at the latter town, and the Silver Springs, Ocala & Gulf at Dunnellen. The largest bridge on the extension will be at this town. It will be an iron draw bridge across the Withlacoochee River.

South Fork.—James Bennett and A. S. Talbot, of Greensburg, Pa., are the contractors on this road between South Fork Station, Pa., and the Cambria and Bedford County line. The road is being built by a local company, but the track will probably be laid by the Pennsylvania, and that company will also operate it. The new line connects with its Pittsburgh Division at South Fork Station, and the route then follows the South Fork of the Conemaugh River easterly for three miles, and thence up Yellow Creek for about nine miles. There are large coal mines at the terminus of the line. The grading will be light, and the maximum grade will be 30 ft. per mile, and the maximum curvature 14 degrees. The contractors have just begun the grading, and now have 100 men at work. J. B. McIntyre, of Greensburg, is the engineer for the contractors.

Spokane Falls & Northern.—It is stated that grading will commence in a few weeks on the proposed extension north from the Columbia River at Marcus. The line has been surveyed northwest from that town through the Indian reservation, along the Kettle River to the Okanogan River in British Columbia, but at present it is only proposed to let the contract for the first 14 miles of the extension.

Sugar Belt.—The right of way with the exception of about two miles is said to have been secured for an extension from Orlando south to Narcoossee, Fla. The line is about 20 miles long and a preliminary survey was made early in the spring. The grading will probably begin in April and it is claimed that the extension will be completed by September. It was reported several months ago that the company had decided to build this extension, but the officers then denied the statement.

Tennessee River, Ashville & Coosa.—The four miles of this road between Whitney, on the Alabama Great Southern, and Ashville, Ala., is now in operation. The engineers are surveying the line northwest from Whitney toward Oneonta and Blountsville. On the southern section the location has been completed from Ashville southeast to the Coosa River, where a connection will be made with the East & West of Alabama. Grading is in progress on this section. The road was originally incorporated by the owners of extensive mineral and timber lands located in St. Clair County, Ala., to build a road about 16 miles long through the county to open up the lands. The charter has since been amended to provide for the construction of a line from Anniston northwest through Ashville and Blountsville to the Tennessee River, near Sheffield, a distance of 170 miles. The northern and southern ends of the line will be through a cultivated agricultural country. There will be heavy work in Blount County over the mountains. About 80 miles of the road will be mountain work. A large party of engineers is now surveying through the mountains near Oneonta and Blountsville. The officers expect to begin the grading early in May on the section between Whitney and Blountsville, which will include the most difficult work. The maximum grade will be 105 ft. per mile and the maximum curves six degrees. Andrew Johnson, Richardson Building, Chattanooga, is the President and General Manager. T. M. T. McKenna, Ashville, Ala., is Chief Engineer.

Toledo, Little Falls & Eastern.—This company was incorporated in Washington last week to build a road between Toledo and Little Falls, by Walter S. Bowen, Willis E. Everette, John M. Steele, Dexter Whitmore and David Gilmore. The capital stock is \$250,000.

Toronto Island.—This company is applying to the Dominion parliament for power to construct a road on Toronto and Ashbridge's islands and to connect with the mainland by means of swing bridges.

Toronto & Sudbury.—Application is being made to the Dominion parliament for power to construct a line from Toronto, on the Ontario & Quebec, west of the Peterborough County line to Sudbury, on the Canadian Pacific, in the district of Nipissing, Ont.

Uniontown & Lick Run.—The company was incorporated in Pennsylvania March 29. It is to build a road from the borough of Uniontown, Fayette County, to a point near the village of Hopwood in a ravine known as Lick Hollow in South Union Township. The length of the line will be four miles. The capital stock is \$50,000. John Boyle, Uniontown Pa., president.

Valley (Ohio).—This road has a through line between Cleveland and Marietta by using the tracks of the Cleveland & Marietta south of Canal Dover. Its own line ends at Valley Junction, 75 miles south of Cleveland; and between that point and Canal Dover, the northern terminus of the Cleveland & Marietta, the tracks of the Cleveland & Pittsburgh are used to complete the route under a trackage agreement between the last two companies. It has been several times reported that an extension would be built from Valley Junction to Canal Dover to give a line independent of the Cleveland & Pittsburgh. The rumor has been revived recently, and it is said that the connection which will be eight miles long, will be built this summer by the Valley road.

Watauga Valley.—This road is being built in East Tennessee from a connection with the main line of the East Tennessee, Virginia and Georgia at Watauga, 20 miles south (or west) from Bristol, Tenn., to Watauga Point, Tenn., on the East Tennessee and Western North Carolina road, a distance of five miles. There is very heavy rock work and three bridges across Watauga River. The contracts were let in October last to Durand & Murphy for graduation, masonry and track laying, and to Anderson & Smalling for bridges and trestles. Three miles of the road is now finished ready for the track, but no rails have as yet been laid. The maximum grade is 33 ft. per mile against 60 ft. with heaviest loads. There is one short curve of 15 degrees and two of 12 degrees. The general curvature is 10 degrees. Four deck span and two through span bridges will be built, each 130 ft. long. The highest trestle is 40 ft. and the longest is 900 ft. Besides the line under construction, a locating survey has been made and contracts will be asked for shortly for building two and a half miles of road. It will be easy work, and will include two small bridges. A preliminary survey has also been made for 13 miles more. This will be rather difficult mountain work, with 12 degree curves and grades of 150 ft. per mile, with heaviest freight. The line will be under construction by fall. The road is being built principally to carry iron ore and timber. The stock is owned by the East Tennessee Mining & Improvement Co. The road will probably be operated by the East Tennessee & Western North Carolina.

West Virginia Central & Pittsburgh.—The grading is now in progress for an extension from Elkins, a station a few miles north of the southern terminus, southwest to Bealington, the southern terminus of the Grafton & Greenbrier road. The line is being built with the intention of securing a new route to Pittsburgh.

West Virginia & Pittsburgh.—At a special meeting of the stockholders at Weston, W. Va., March 25, it was voted that the route be changed from the point where the present location crosses the boundary line between Webster and Randolph counties to the mouth of Cherry River, and a new line location was adopted for the road, extending from a point near Flatwood's Summit, Braxton County, via Laurel Creek of Elk River, through the counties of Braxton and Webster, to the mouth of Cherry River, in Nicholas County.

F. H. Blodgett & Co., of Parkersburg, W. Va., have secured the contract to build 11 miles of the branch south along Williams River.

Wilmington & Southern.—A new survey has been made recently by this company for the road from Wilmington south to Southport, in Brunswick County, N. C., via Masonboro. The distance is about 20 miles. A new charter was secured by the company at the last session of the North Carolina legislature, and it is claimed that grading will begin near Wilmington very shortly.

Wisconsin Central.—It is stated that a survey will be made very soon for a branch from Oshkosh westerly and southwesterly to Montello, Wis., about 40 miles. The line will pass through Omro, Eureka, Berlin and Princeton. Several of the towns have agreed to grant free right of way, and to issue bonds for the road if it is built.

GENERAL RAILROAD NEWS.

Abingdon Coal & Iron.—A proposition to subscribe for \$150,000 of the stock of this company was voted on by Washington County, Tenn., last week, but it was defeated through the light vote cast.

Baltimore & Drum Point.—The Maryland State Court of Appeals delivered an opinion this week against the railroad company in the suit brought by a number of the taxpayers of Anne Arundel County to restrain the county commissioners from paying over the \$200,000 of the county bonds, which the company claims is due it. The decision states that the subscription of the bonds has become void and the county is relieved from the payment. The subscription was made at an election held over 10 years ago, and none of the grading through the county was completed until the last few years.

Bedford & Bridgeport.—The foreclosure sale occurred in Philadelphia March 26, and the property of the company was sold to George Kugler, for \$50,000. The purchase was made for the Pennsylvania, under whose control the road has been for several years.

Canadian Pacific.—The company has asked the Dominion parliament for power to increase the amount of consolidated debenture stock, to be issued for the purpose of completing the purchase of the Calgary & Edmonton, exchanging stock bearing four per cent. interest for the Calgary & Edmonton bonds bearing six per cent.

Chattanooga Union.—The present directors and stockholders of this road are reported to have sold a controlling interest of the stock of the company to J. Baxter, of Chattanooga, and his associates. The new owners of the stock will effect a reorganization in May. The road is about 41 miles long and is a belt line encircling the city of Chattanooga and connecting with all the roads entering the city. It has lines to Lookout Mountain and various resorts near the city and has a large passenger business.

Chicago, Burlington & Quincy.—The February statement of earnings, including all controlled roads, shows gross earnings of \$2,277,004, a decrease of \$351,508. The net deficit after deduction of operating expenses and one-twelfth of annual charges (estimated for 1891), is \$184,479, against a surplus of \$15,000 in February, 1890.

Helena, Hot Springs & Western.—The Farmers' Loan & Trust Co., of New York, has filed a bill in the United States Court at Helena, Mont., for the foreclosure of a mortgage of \$150,000 given by the road to secure its bonds.

New York, Lake Erie & Western.—The following table gives the earnings of the company for February, 1891, and for the five months, Oct. 1, 1890, to Feb. 28, 1891:

February:	1891.	1890.	Inc. or dec.
Gross earn.....	\$2,054,403	\$2,056,486	D. \$2,083
Oper. expen.....	1,306,261	1,348,192	I. 17,769
	\$688,142	\$707,994	D. \$19,852
Less proportions due leased lines.....	178,903	200,801	D. 21,898
Net earn.....	\$509,239	\$507,193	I. \$2,046
Oct. 1 to Feb. 28:			
Gross earn.....	\$11,831,479	\$11,684,306	I. \$147,173
Oper. expen.....	7,988,229	7,728,402	I. 260,827
	\$3,843,250	\$3,955,904	D. \$112,654
Less proportions due leased lines.....	1,063,493	1,085,833	D. 17,339
Net earn.....	\$2,779,756	\$2,870,071	D. \$90,315

Rome, Watertown & Ogdensburg.—Judge Barker, of Watertown, N. Y., as referee, has rendered a decision adverse to the application of the Carthage, Watertown & Sacketts Harbor Railroad to have the courts annul the lease of its line by the Utica & Black River road to the Rome, Watertown & Ogdensburg.

Texas Central.—The foreclosure sale of this road, which was to have been held at Waco, Tex., March 26, has been postponed until April 22. The road is now operated by the Southern Pacific as one of its local Texas lines, and when the foreclosure sale occurs the property will probably be purchased by that company. The main line extends from Roski to Albany, Tex., 180 miles. The sale is to be made pursuant to a decree in favor of the Farmers' Loan & Trust Co. of New York against the Texas Central and Morgan's Louisiana & Texas Co.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, April 1, 1891.
The action of the Missouri Pacific in cutting the sugar rate from the seaboard to the Missouri River from 45 to 40 cents, via the Kanawha Dispatch line, as noted last week, is likely to prove a serious matter. The cut gives the Kanawha an advantage of eight cents over the Chicago lines, as it has a differential of three cents against the Chicago rate of 43. The Dispatch line claim that they are receiving their full proportion of the tariff rates and know nothing about the making of the cut-rate tariff, which leaves the entire cut to be borne by the Missouri Pacific. In making the tariff the Missouri Pacific has violated the agreements of both the Western Traffic Association and the Western Freight Association, of both of which associations it is a member, the tariff having been issued by the New York agent. Complaint has been made to these associations by the other lines, calling for an investigation, and the matter has been taken up by Chairmen Walker and Midgley and the Missouri Pacific asked to justify its action. None of the other lines have met the reductions, and all the sugar is going via Newport News on the illegitimate tariff. Should the Missouri Pacific be unable to justify its action to the satisfaction of the chairmen the matter will be taken before the Advisory Board of the Western Traffic Association, which convenes here on April 14.

The General Managers of the Western Passenger Association held a meeting Monday, and listened to the report of Chairman Finley in regard to the Jacksonville Southeastern ticket case. The Jacksonville Southeastern has joined the Western Passenger Association, to take effect to-day, but yet the matter has not been satisfactorily disposed of, the Alton claiming that the Jacksonville line has a contract with a scalper lasting ten months.

The Chicago, St. Paul & Kansas City has again been accused of manipulating passenger rates by placing a block of tickets in the hands of scalpers, reading from St. Paul to St. Joseph, which on the opening of the road to Kansas City were endorsed good through to the latter point, thus cutting the rate \$1.20. The road has agreed to get the tickets off the market and has been given until April 6 to do so.

The Central Traffic line holds a meeting here April 8 to consider the subject of discontinuing the sale of unlimited tickets.

The fruit growers of Southern Illinois have complained to the Board of Railroad and Warehouse Commissioners that the roads discriminate against them by charging more for a mixed car of fruit and vegetables than they do for a straight car. They claim it is impossible to load straight and get their fruit to market in season. On the other hand, the vegetable shippers are satisfied with the rate as now adjusted, and think the fruit men want to get an advantage. The roads claim that they have repeatedly lowered the rates at the request of the fruit men, until they are now so low that there is very little if any profit in the business.

The Chicago Rate Committee meets April 3. This is the annual meeting for the election of officers. It is considered certain that A. F. McMillan will be re-elected Secretary. The most important matter for consideration, aside from the election, will be the question of the re-issue of the Chicago Joint Division book.

The new vestibule line of the Illinois Central between Chicago and New Orleans was opened March 29. The Company gave a trial trip to Kankakee March 28, which was enjoyed by a large number of invited guests. The train leaves Chicago at 3 p. m., reaching New Orleans at 8 p. m. the following day.

Chairman Midgley has issued a circular instructing agents that all import traffic via any route which reaches the western freight lines on through rate or through billing at their eastern termini from foreign ports must be rebilled at the full local tariff rates applying from Chicago, Peoria or Mississippi River points, and that the proportions applicable on business from Atlantic seaboard points will not apply on the traffic in question.

Chairman Walker, of the Western Traffic Association, has issued a decision on a request of the Chicago, Burlington & Quincy that the through tariffs of the Rock Island and the Atchison roads in connection with the Chicago, St. Louis & Pittsburgh from Chicago to points west be cancelled. In order to secure westbound business from factories located on the C., St. L. & P. the Atchison and the Rock Island have made through rate arrangements with the C., St. L. & P., giving it 15 per cent. of the through rate to the Missouri River. This is considerably more than the regular switching charge. The Commissioners decide that the tariffs complained of should be cancelled not later than April 30, 1891, and that the practice of applying the regular Chicago rates from the depot of the Chicago, St. Louis & Pittsburgh or other Eastern roads be discontinued. The report says: "It appears for the best interest of all, that each mem-

ber should be satisfied with the advantages pertaining to the location of its own depot and the side tracks which it can reach by proper switching arrangements."

Traffic Notes.

A California dispatch of March 30 says that 10 special trains loaded with oranges went East from that state in one day, the 29th.

Florida orange growers are complaining to the Interstate Commerce Commission of discriminations and excessive freight rates.

A Chicago firm has been swindled by a forged bill of lading for 11 cars of live stock, purporting to have been given at Windsor, Mo.

The Texas legislature has passed a radical law providing for a railroad commission with sweeping powers. The details of the bill have not been published. It is said that the governor has signed the bill, and that the appointment of the commissioners devolves upon him.

The National Association of Car Service Managers has elected the following officers: E. M. Moore, Chicago, President; A. M. Simmonds, Cleveland, Vice-President; A. G. Thomason, Scranton, Secretary. The next meeting will be held in New York next October.

A new limited express train is to be put on about June 1 between Boston and Chicago over the Boston & Albany, New York Central and Lake Shore. The train will leave Boston at 10:30 a. m. and reach Chicago about 3 p. m. the next day, similar time being made on the Eastward trip.

Indianapolis dispatches state that the Federal Grand Jury have indicted Albert Stimson, G. F. A., and C. O. Stimson, local agent of the Big Four at Indianapolis, on a complaint made by the grain shippers of Lafayette, Ind., to the Interstate Commerce Commission, charging discrimination at that point. There were several other complaints made, but they went over until the next term on account of the absence of important witnesses.

The New York Central & Hudson River has modified its commutation ticket system on some parts of the road. On the Harlem Division 52-ride tickets are now sold at a uniform price per month instead of at rates graduated from a high one the first month of the year to a low price the twelfth month. It is stated that the rate per ride between New York and White Plains has been reduced from 13 to 10 cents, and presumably in a similar ratio between other stations.

A freight bureau will be formed at St. Louis under the name of the Commercial and Industrial Union of St. Louis. The preliminary proceedings are well along, and the organization will be supported by the Merchants' Exchange, Cotton Exchange, Merchants' Transfer Association and a dozen other similar bodies. A somewhat similar movement is on foot at Philadelphia, but the movement to secure stop-over privileges at that city for merchants from the West and South visiting New York seems to be the one big reason for the action taken.

Nebraska Rate Law.

Numerous signed petitions from the more important cities and towns of Nebraska have been sent to Governor Boyd calling on him to veto the Newberry maximum freight rate bill recently passed by the legislature. The petitioners include railroad employes, boards of trade and representative business men. The bill practically lowers all the rates 20 per cent., and will extend far outside the limits of the state in its effect. The opponents of the measure are confident that they have strength enough to prevent its passage over a veto. It is reported that Governor Boyd will refuse to act on the bill until the question of whether he or Mr. Thayer is Governor shall have been settled. A Lincoln dispatch states that the bill makes a reduction from present rates of much more than 20 per cent. on some articles. When two or more railroads are used in shipments between points in the state, the rate must be fixed according to the shortest mileage distance by any railroad. Railroads deeming rates unjust shall, if it can be shown on which branches rates would be unreasonable, be exempt from the provisions. All railroads which may be built within the next two years are exempt from the provisions of the act until Dec. 31, 1895.

Decision About Cotton Rates.

The Interstate Commerce Commission has announced its decision in the case of the New Orleans Cotton Exchange against the Louisville, New Orleans & Texas road in an opinion by Commissioner Morrison. Complaint was made that the road charges higher rates on cotton from Memphis and other points in Tennessee and Mississippi to New Orleans than it charges on cotton intended for export and shipped from the same points to Southport, La., within the port of New Orleans, and that rates charged by it on both domestic and export cotton shipments are not posted in its offices at New Orleans. Since the hearing the road has equalized the rates on cotton to its terminal stations in New Orleans, and therefore no order directing it to do so is necessary, but an order will be issued requiring it to post in its terminal stations at New Orleans in convenient form for public inspection the rates in force between its New Orleans termini and stations in Tennessee and Mississippi, as well on freight for export as on that which is not.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, March 28, amounted to 82,193 tons, against 76,392 tons during the preceding week, an increase of 5,801 tons, and against 91,485 for the corresponding week of 1890, a decrease of 9,292 tons. The proportions carried by each road were:

	Wk. to Mar. 28.		Wk. to Mar. 21.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	10,223	12.4	9,116	11.9
Wabash.....	5,154	6.3	4,867	6.4
Lake Shore & Michigan South.....	10,217	14.4	10,939	14.4
Pitts., Ft. Wayne & Chicago.....	7,422	9.0	7,757	10.2
Chicago, St. Louis & Pitts.....	9,278	11.3	8,071	10.6
Baltimore & Ohio.....	3,460	4.2	4,786	6.3
Chicago & Grand Trunk.....	12,826	15.6	13,551	17.7
New York, Chic. & St. Louis.....	12,395	15.1	10,245	13.4
Chicago & Atlantic.....	11,218	13.7	6,970	9.1
Total.....	82,193	100.0	76,392	100.0

Of the above shipments 4,876 tons were flour, 47,008 tons grain, 6,577 tons cured meats, 2,088 tons lard, 7,382 tons dressed beef, 1,053 tons butter, 1,077 tons hides, 87 tons wool and 6,530 tons lumber. The three Vanderbilt lines together carried 39.9 per cent., while the two Pennsylvania lines carried but 20.3 per cent.